

PAPERS FROM
TORTUGAS LABORATORY

VOLUME XXXIV



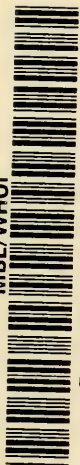
Gift of

Richard H. Backus

May, 1988

Dik Bakus

MBL/WHOI



0 0301 0010486 5

SYSTEMATIC CATALOGUE OF THE FISHES OF TORTUGAS, FLORIDA

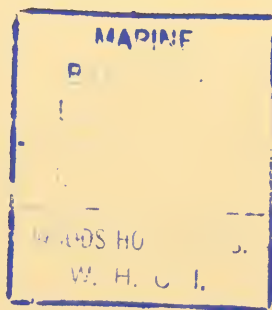
*With Observations on Color,
Habits, and Local Distribution*

BY

WILLIAM H. LONGLEY, *Late Professor of Biology,
Goucher College, and Executive Officer, Tortugas
Laboratory, Carnegie Institution of Washington*

EDITED AND COMPLETED BY

SAMUEL F. HILDEBRAND, *Senior Ichthyologist,
United States Fish and Wildlife Service*



CARNEGIE INSTITUTION OF WASHINGTON PUBLICATION 535
WASHINGTON, D. C.

1941





THE WILLIAM BYRD PRESS, RICHMOND, VIRGINIA
THE MERIDEN GRAVURE COMPANY, MERIDEN, CONNECTICUT

CONTENTS

	PAGE
LIST OF PLATES	v
INTRODUCTION	vii
Acknowledgments	viii
Explanations	viii
THE TORTUGAS ISLANDS	x
NEW GENERA AND SPECIES	xi
BIBLIOGRAPHY OF PUBLICATIONS BY WILLIAM H. LONGLEY BASED ON HIS STUDIES AT TORTUGAS	xi
SYSTEMATIC CATALOGUE	PAGE
Branchiostomidae	1
Scylliorhinidae	1
Ginglymostomidae	1
Carchariidae	2
Sphyrnidae	3
Squalidae	3
Rajidae	4
Dasyatidae	4
Myliobatidae	4
Elopidae	4
Albulidae	5
Clupeidae	5
Dussumieriidae	12
Engraulidae	12
Alepocephalidae	14
Argentinidae	14
Melanostomiidae	15
Gonostomidae	15
Sternoptichidae	16
Synaphobranchidae	16
Congridae	17
Echelidae	17
Ophichthyidae	18
Muraenidae	18
Synodontidae	20
Sudidae	24
Myctophidae	26
Belonidae	27
Hemiramphidae	30
Exocoetidae	31
Macrouridae	32
Bregmacerotidae	34
Gadidae	35
Merlucciidae	38
Bothidae	39
Pleuronectidae	48
Achiridae	48
Cynoglossidae	49
Zeidae	50
Polymixiidae	52
Trachichthyidae	53
Holocentridae	53
Syngnathidae	55
Aulostomidae	66
Fistularidae	67
Macrorhamphosidae	67
Atherinidae	68
Mugilidae	69
Sphyrænidae	69
Scombridae	71
Gempylidae	72
Trichuridae	73
Istiophoridae	74
Coryphaenidae	74
Nomeidae	74
Carangidae	75
Apogonidae	83
Centropomidae	92
Serranidae	92
Priacanthidae	112
Pempferidae	113
Lobotidae	115
Lutianidae	115
Haemulidae	122
Sparidae	130
Kyphosidae	134

	PAGE		PAGE
Gerridae	135	Uranoscopidae	244
Mullidae	141	Dactyloscopidae	245
Sciaenidae	143	Blenniidae	246
Malacanthidae	145	Microdesmidae	276
Antigoniidae	146	Brotulidae	276
Chaetodontidae	147	Ophidiidae	281
Acanthuridae	154	Carapidae	282
Scorpaenidae	157	Batrachoididae	283
Peristediidae	167	Gobiesocidae	283
Triglidae	170	Triacanthidae	285
Dactylopteridae	174	Balistidae	286
Pomacentridae	175	Monacanthidae	289
Labridae	187	Ostraciidae	297
Scaridae	205	Tetraodontidae	299
Eleotridae	222	Canthigasteridae	300
Gobiidae	224	Diodontidae	301
Echeneidae	234	Lophiidae	303
Callionymidae	234	Antennariidae	303
Pteropsaridae	237	Chaunacidae	309
Opisthognathidae	238	Ogcocephalidae	311
INDEX			317
PLATES			

LIST OF PLATES

(All plates, except as otherwise indicated, are from under-sea photographs
by William H. Longley)

PLATE

1. Fig. 1. *Aulostomus maculatus*
Fig. 2. *Aulostomus maculatus*
2. Fig. 1. *Holocentrus ascensionis*
Fig. 2. *Sphyaena barracuda*
Fig. 3. *Caranx ruber*, *Anisotremus virginicus*, *Acanthurus* sp.
3. Fig. 1. *Apogon maculatus*, details of markings on head (painting by Manson Valentine)
Fig. 2. *Epinephelus striatus*
4. Fig. 1. *Epinephelus striatus*
Fig. 2. *Epinephelus morio*
5. Fig. 1. *Epinephelus morio*
Fig. 2. *Epinephelus morio*
6. Fig. 1. *Mycteroperca venenosa*
Fig. 2. *Mycteroperca venenosa*
7. Fig. 1. *Mycteroperca venenosa*
Fig. 2. *Mycteroperca venenosa*
8. Fig. 1. *Mycteroperca tigris*
Fig. 2. *Lobotes surinamensis*, details of markings on head (painting by Manson Valentine)
9. Fig. 1. *Lutianus griseus*
Fig. 2. *Lutianus apodus*
10. Fig. 1. *Lutianus analis*
Fig. 2. *Lutianus jocu*
11. Fig. 1. *Lutianus jocu*
Fig. 2. *Ocyurus chrysurus*
12. Fig. 1. *Ocyurus chrysurus*, *Halichoeres bivittatus*
Fig. 2. *Haemulon macrostomum*
13. Fig. 1. *Haemulon parra*, *Haemulon sciurus*, *Lutianus griseus*
Fig. 2. *Haemulon parra*, *Haemulon sciurus*
14. Fig. 1. *Haemulon carbonarium*, *Haemulon parra*
Fig. 2. *Haemulon sciurus*, *Haemulon plumieri*
15. Fig. 1. *Haemulon plumieri*, *Haemulon sciurus*
Fig. 2. *Haemulon plumieri*, *Haemulon sciurus*
16. Fig. 1. *Brachygenys chrysargyreus*
Fig. 2. *Anisotremus virginicus*
17. Fig. 1. *Calamus* sp., probably *calamus*; *Halichoeres bivittatus*
Fig. 2. *Diplodus holbrookii*
18. Fig. 1. *Mulloidichthys martinicus*, *Haemulon sciurus*
Fig. 2. *Mulloidichthys martinicus*, *Haemulon sciurus*
19. Fig. 1. *Pseudupeneus maculatus*
Fig. 2. *Pseudupeneus maculatus*, *Ocyurus chrysurus*, *Scarus* sp., *Halichoeres bivittatus*

PLATE

20. Fig. 1. *Odontoscion dentex*
 Fig. 2. *Eques acuminatus* (drawings by Manson Valentine)
 Fig. 3. *Chaetodon capistratus*, ocular band (drawings by Manson Valentine)
21. Fig. 1. *Chaetodon ocellatus*
 Fig. 2. *Chaetodon ocellatus*, *Acanthurus* sp.
22. Fig. 1. *Pomacanthus aureus*
 Fig. 2. *Pomacanthus aureus*
23. Fig. 1. *Scorpaena plumieri*, details of markings on head (painting by Manson Valentine)
 Fig. 2. *Scorpaena plumieri*, *Lutianus* sp.
24. Fig. 1. *Abudefduf saxatilis*
 Fig. 2. *Abudefduf taurus*, *Lutianus apodus*
25. Fig. 1. *Lachnolaimus maximus*
 Fig. 2. *Lachnolaimus maximus*, *Halichoeres bivittatus*
26. Fig. 1. *Thalassoma bifasciatum* (painting by Manson Valentine)
 Fig. 2. *Xyrichtys psittacus*
27. Fig. 1. *Sparisoma abildgaardi*
 Fig. 2. *Sparisoma abildgaardi*
28. Fig. 1. *Sparisoma abildgaardi*
 Fig. 2. *Sparisoma pachycephalum*
29. Fig. 1. *Scarus croicensis*
 Fig. 2. *Coryphopterus glaucofraenum*, details of markings on head (painting by Manson Valentine)
30. Fig. 1. *Opisthognathus aurifrons*
 Fig. 2. *Labrisomus nuchipinnis*, details of markings on head (painting by Manson Valentine)
31. Fig. 1. *Hypoleurochilus bermudensis*, external genitalia (drawings by Manson Valentine)
 Fig. 2. *Rupiscartes atlanticus*, external genitalia (drawings by Manson Valentine)
32. Fig. 1. *Lactophrys triqueter*, *Halichoeres bivittatus*
 Fig. 2. *Lactophrys triqueter*, *Ocyurus chrysurus*, *Halichoeres bivittatus*
33. Fig. 1. *Balistes vetula*
 Fig. 2. *Ogcocephalus cubifrons*, details of markings on head (painting by Manson Valentine)
34. *Histrio gibba* (paintings by Manson Valentine)

INTRODUCTION

The observations in this book have been made at intervals during twenty-five years. Less clearly realized at first, more clearly later, always the guiding principle has been that light on the process of evolution should be obtainable from study of its product, that in the very texture of the color pattern of animals, in the complex web of relations binding species to species, the play of cause and effect by which they were made should be decipherable.

So much ground has been covered in the course of the inquiry that it does not seem wise to attempt to present all the results in one volume.¹ Hence the hidden interest to which reference has been made seems even more obscure than it might otherwise have been. Its existence, however, and minor changes in front in serving it, explain an unevenness in the work, which before anyone else the ichthyologist will appreciate.

There are so many kinds of fishes, and they do so many things in different ways, at different times and places, that it has proved quite impossible to find out all of interest about any one, or how all of them do a particular thing. But no reasonable effort has been spared to discover the truth with the same degree of accuracy for all.

The faunas and floras of every region include names of species of doubtful or no validity. Each of the latter, of course, represents some misconception of fact. These misconceptions arise from different causes, often quite beyond the power of the taxonomist to control. But these species falsely conceived, when accepted at face value, tend to blur the conception we have of species as groups existing in fact. Unless some correction is applied on their account, they tend to invalidate inferences drawn from the statistics of taxonomy.

I have endeavored to bring a field naturalist's experience to the aid of taxonomy. It has proved necessary to refer many species to synonymy. The decision in every instance has been based, not on the ground that the nominal species so treated does not differ enough from some other to justify recognition under a distinct name, but on the ground that it does not differ at all. For the most part the changes introduced are based upon nothing more than recognition of unsuspected sexual dimorphism, or of the effects of age, transient color change, the accidents of imperfect preservation, and the like. They rectify previous judgments in a large enough number of instances to give some suggestion regarding the type of error the taxonomist is most likely to commit, and the genera and species whose relationships he is most likely to misconceive.

In a few points comparisons of the record will show that my observations repeat those of Jordan and Thompson (*Bull. U. S. Bur. Fish.*, vol. 24, 1904 (1905),

¹ That Dr. Longley intended to write other treatises on his studies at Tortugas is brought out here. The other work or works would have dealt with his "hidden interest" (see next sentence in text), namely, the bearing his observations had on the process of evolution. The bibliography presented herewith contains subjects of papers dealing wholly or in part with evolution.—S. F. H.

pp. 229-256), and of Gudger (Carnegie Inst. Wash. Pub. 391, 1929, pp. 149-204), who have preceded me in the study of Tortugas fishes. The repetitions frequently concern matters of relatively little importance. No attempt has been made to correlate our several experiences in detail. W. H. L.

The foregoing introduction by Dr. Longley may have been only a tentative draft. It sets forth his intention and purpose, however, as no one else could have done. It is fortunate, therefore, that he left this much.

ACKNOWLEDGMENTS

The introduction was not completed; it ended with the unfinished statement, "It is a pleasure to acknowledge . . ." It is, of course, entirely impossible for me to make proper acknowledgments for Dr. Longley. I can only state that the persons named in the following sentences are mentioned in the body of the book as having been helpful. Dr. Waldo L. Schmitt, of the U. S. National Museum, is mentioned several times as having reported interesting observations, and as having furnished identifications of crustaceans. It was in the course of Dr. Schmitt's work at Tortugas that most of the deep-sea fishes were collected. He took a personal interest in this work which never abated. I take this opportunity of expressing my gratitude to him for the help he has given me in continuing the study of the specimens, and in completing the manuscript. As he had worked at Tortugas, and is thoroughly familiar with local conditions, I appealed to him often for information and advice, which he always willingly supplied.

Other persons mentioned in the book as having been helpful are Dr. Paul Bartsch, of the National Museum; Dr. Charles M. Breder, Jr., of the New York Aquarium; and Dr. Harold W. Manter, of the University of Nebraska. All these men carried on research at Tortugas, and I am sure that Dr. Longley would have included proper acknowledgment of the services they rendered. He would no doubt have expressed his gratitude to others of whom I have no knowledge.

In addition to extending my personal thanks to Dr. Waldo L. Schmitt, in a foregoing paragraph, I wish to thank Dr. Leonard P. Schultz and Earl D. Reid, of the National Museum, who have been very helpful, and in whose laboratories the Tortugas collection was studied.

EXPLANATIONS

The manuscripts, notes, and collection fell into my hands because Dr. Longley, during his illness, expressed the hope that I might see fit and be available to complete this monograph, in the event that he should not recover. I feel honored to have been chosen for this task, and although I was obliged to alter plans and to lay aside temporarily work under way, it has afforded me pleasure to carry out this hope and wish of a friend and an esteemed scholar.

Presumably because of Dr. Longley's unexpected and rather sudden withdrawal from the work, or possibly because of what happened after his withdrawal, the manuscript reached me in a rather disorganized state. I strongly suspect that small parts of it were lost, and that in some cases his latest or final

draft did not reach me. In such instances it was necessary to review the field data, and either to draw up new accounts or to revise and extend old ones. It was necessary, also, to consult his notebooks for the preparation of accounts of those species that had not been treated at all in the manuscript. Inasmuch as the six large ledgerlike notebooks, and several smaller ones, were not indexed, it was necessary to prepare an index. It is evident, then, that considerable preliminary work had to be done before the work of completing the manuscript could be undertaken.

The collection also was received wholly unorganized. Unfortunately few of the specimens, probably less than 5 per cent, were labeled either as to locality or as to their identity. Sometimes it was possible to supply these data from field notes. More often it was necessary to identify the specimens anew and simply to label them as from "Tortugas, Florida."

It is understood that Dr. Longley knew the local fish fauna so well that he did not need labels. However, with due respect to this honest and sincere worker, the desirability of providing adequate labels, because of the uncertainty of human life, is well illustrated here. Preachment of course is out of place, but I am sure that taxonomists in general would join me in admonishing biologists and collectors of scientific specimens in general to furnish adequate data.

An effort was made throughout the work to identify the specimens, which are deposited in the National Museum, in accordance with Dr. Longley's classification, as set forth in his manuscript, except in those few instances when he was obviously in error. It was not always easy to follow his classification, as sometimes diagnostic characters were not given, or they were based too largely on color in life to be usable for preserved specimens. Difficulty in making identifications was met because of faded colors, especially in the Pomacentridae and the Scaridae. In some instances I have supplied diagnostic characters. In others, if it seemed desirable because of new species or additional information discovered, keys were introduced.

The rather frequent references to and comparisons with fishes from Key West, Florida, in sections added by me, result from my familiarity with the closely allied fish fauna of that vicinity, after more than a year spent there in study.

As Dr. Longley, in the part of this introduction prepared by him, did not describe his method of work, which seems important, I may point out that he was a pioneer in using the diving helmet. Most of the observations reported in this book are based on what he actually saw while living, as it were, under water with the fish. He stated in his notes that many fishes are unafraid of the diver, and that it was possible to observe their behavior and details of color at close range. He used a wax-covered slate for taking notes under water, which later were transcribed on paper.

The under-water photographs published herewith were taken with a camera enclosed in a watertight brass box, with a front and a rear window of plate glass. The box was built with external attachments for manipulating the mechanisms of the camera.

The sequence of the families and usually of the genera is in agreement with

Jordan, Evermann, and Clark's *Check list of the fishes and fishlike vertebrates of North and Middle America north of the northern boundary of Venezuela and Colombia* (Report, U. S. Commissioner of Fisheries, pt. 2, 1928 (1930), 670 pp.). This work is cited in the catalogue as the *Check list*. The division therein of some of the families and genera, as formerly understood, into smaller groups, however, has not always been followed.

Without doubt, Dr. Longley, after a quarter of a century of diving at Tortugas and elsewhere, knew the habits and haunts of tropical and subtropical reef fishes better than any other person of his day. Though his classifications on the whole are believed to be accurate, and useful to taxonomists, the most important part of this monograph consists in the under-water observations reported. These observations are the more important because of Dr. Longley's accurate knowledge of species. It is evident from the great amount of time he spent in museums (having visited all the important ones in America and Europe) during the later years of his life in the study of types and other important specimens that he was more and more impressed, as his work progressed, with the supreme importance of the proper recognition of species.

S. F. H.

THE TORTUGAS ISLANDS

The following account of the Tortugas Islands has been extracted and condensed from a lecture (unpublished) by Dr. Longley:

The Tortugas are a group of small sandy islands, the terminal members of the series of keys which fringe the southern Florida coast. They are really the outermost exposed parts of a great sandspit, projecting in a southwesterly direction roughly two hundred miles into the Gulf of Mexico.

The name, Tortugas, is the Spanish equivalent for Turtle Islands. This name was suggested by the many sea turtles that in years gone by came there to lay their eggs in the sand. It seems that as recently as fifty to sixty years ago as many as forty turtles came ashore to lay eggs in a single night. Now as few as four or five come ashore in the course of a whole season, which is perhaps six to eight weeks long.

The islands are known as the Dry Tortugas because they contain no natural supply of fresh water. The only fresh water on the islands now is that obtained by storing rain water.

The position of the islands, lying far from the mainland at the western entrance of the Florida Strait, has determined their whole history. Their location necessitated the erection of a large lighthouse, on Loggerhead Key, where the laboratory of the Carnegie Institution of Washington was also situated. Their position without doubt also governed the decision to construct a fort, which was erected on Garden Key and is known as Fort Jefferson.

During and after the Civil War Fort Jefferson served as a military prison. After that period little attention was paid to it from a military point of view, until the Spanish-American War broke out, when a coaling station was estab-

lished there. Some years later the coaling station was wrecked by a hurricane and the small garrison was removed.

It so happened that shortly after the establishment of the coaling station on Garden Key, the Carnegie Institution of Washington was looking for a favorable location for a marine biological laboratory. The Tortugas keys in many respects afforded an ideal site for such a station. The islands are far from the mainland and the water about them therefore is free from contamination and from sediment brought down by streams. The Gulf Stream passes by only a few miles to the south, and water-borne organisms drift to the shores. For these and perhaps other reasons the Tortugas Laboratory of the Carnegie Institution was established in 1904, on a site leased from the United States Government, and maintained until 1940 as a research center.

A wide range of conditions, supplying various habitats for fishes, exists in the immediate vicinity: stretches of bare sand, areas overgrown with turtle grass and algae, coral reefs, channels of a depth of 10 to 20 fathoms between the keys, and deep water to the southward. The large drifts of sargassum that come in shore from time to time offer still another habitat for certain fishes.

Further descriptions of the Tortugas archipelago appear in publications of the Department of Marine Biology (Tortugas Laboratory) of the Carnegie Institution of Washington; many restricted areas are described in this catalogue; and a concise general description of the atoll by Dr. E. W. Gudger is found in Carnegie Institution of Washington Publication 391, 1929, pages 151 and 152. S. F. H.

NEW GENERA AND SPECIES

The investigation disclosed a few new genera and 29 new species. Some of these had been described briefly by Dr. Longley in various Year Books of the Carnegie Institution of Washington (see bibliography, p. xii). New descriptions of these, as well as of several species not previously described, are included in a preliminary paper entitled "New genera and species of fishes from Tortugas, Florida," by Longley and Hildebrand, Carnegie Institution of Washington Publication 517, *Papers from Tortugas Laboratory*, volume 32, paper XIV, pages 223 to 285. In the present work, the new genera and species are not described, but references to the preliminary paper are given. S. F. H.

BIBLIOGRAPHY OF PUBLICATIONS BY WILLIAM H. LONGLEY BASED ON HIS STUDIES AT TORTUGAS

The papers by Dr. William H. Longley listed herewith are based wholly or in part on his work at Tortugas. Some of these will cast considerable light on phases of his studies not dealt with in the present volume, which he intended to write up more fully later in one or more separate volumes. Some, but not all, of the publications listed are referred to in the text.

Carnegie Institution of Washington Year Books

- a.* Reports of Department of Marine Biology (Year Books Nos. 12–22); Reports of Tortugas Laboratory (Year Books Nos. 23–34)
Report of investigation of color of gulf-weed fauna and of reef fishes. No. 12,¹ 1913, pp. 177–178.
Report upon color of fishes of the Tortugas reefs. No. 13, 1914, pp. 207–208.
Coloration of tropical reef fishes. No. 14, 1915, pp. 208–209.
The significance of the colors of tropical reef fishes. No. 15, 1916, pp. 209–212.
Report of observations and experiments upon the biological significance of animal coloration and an extension of the field of color-photography. No. 16, 1917, pp. 182–185.
Report of additional observations and experiments upon problems of animal coloration. No. 18, 1919, pp. 201–202.
Habits and local distribution of Tortugas fishes. No. 20, 1921, pp. 204–205.
The fishes of Tortugas and their habits. No. 21, 1922, pp. 171–173.
Observations upon submarine color photography, the food and rate of digestion of fishes, and the power of discrimination and association in the gray snapper. No. 22, 1923, pp. 159–163.
Observations upon Tortugas fishes. No. 23, 1924, pp. 191–193.
Observations upon the powers of discrimination and association in the gray snapper, and upon the coloration of the eyes of fishes. No. 24, 1925, pp. 228–230.
Observations upon the food of certain Tortugas fishes (with W. L. Schmitt and W. R. Taylor). No. 24, 1925, pp. 230–232.
Observations on Tortugas fishes. No. 25, 1926, pp. 241–242.
Observations upon the ecology of Tortugas fishes with notes upon the taxonomy of species new or little known (definition of three new genera and two species). No. 26, 1927, pp. 222–224.
Observations on Tortugas fishes, especially those on which the noddy and sooty terns of the Bird Key rookery feed. No. 28, 1929, pp. 288–290.
Observations upon distribution and behavior of Tortugas fishes. No. 29, 1930, pp. 337–338.
Observations on Tortugas fishes. No. 30, 1931, pp. 385–386.
Observations upon Tortugas fishes. No. 31, 1932, pp. 286–287.
Studies on West Indian fishes: description of six new species. No. 33, 1934, pp. 257–260.
Osteological notes and descriptions of new species of fishes. No. 34, 1935, pp. 86–89.
- b.* Biology
Preparation of a monograph on the Tortugas fishes. No. 31, 1932, pp. 299–301; No. 32, 1933, pp. 293–295; No. 33, 1934, pp. 270–272; No. 34, 1935, pp. 283–284.

Observations upon tropical fishes and inferences from their adaptive coloration. *Proc. Nat. Acad. Sci.*, vol. 2, 1916, pp. 733–737.

The selection problem. *Amer. Naturalist*, vol. 51, Apr. 1917, pp. 250–256.

¹ This number and subsequent ones in sections *a* and *b* are the serial numbers of the Year Books.

Studies upon the biological significance of animal coloration. I: The colors and color changes of West Indian reef fishes. Jour. Exper. Zool., vol. 23, 1917, pp. 536-601.

Studies upon the biological significance of animal coloration. II: A revisional working hypothesis of mimicry. Amer. Naturalist, vol. 51, May 1917, pp. 257-285.

Haunts and habits of tropical fishes. Amer. Mus. Jour., vol. 18, Feb. 1918, pp. 78-88, with figs.

Marine camoufleurs and their camouflage: the present and prospective significance of facts regarding coloration of tropical fishes. Smithsonian Rept., 1918 (1920), pp. 475-485, with 5 pls., 9 figs.

Life on a coral reef. Nat. Geog. Mag., vol. 51, Jan. 1927, pp. 61-83, with 22 figs.

Species studies and the species problem. Amer. Naturalist, vol. 70, Mar.-Apr. 1936, pp. 97-109.

Systematic Catalogue

Family BRANCHIOSTOMIDAE. LANCELETS

Branchiostoma caribaeum Sundevall

Dr. Longley listed 3 specimens in his notes: one taken in a dredge in about 10 fathoms, another in about 20 fathoms, and a third taken in a trawl, all from the channel southwest of Tortugas.

Apparently previously recorded only from the West Indies. S. F. H.

Family SCYLLIORHINIDAE. CAT SHARKS

Scylliorhinus retifer (Garman)

Dr. Longley's notes state that 10 or more small specimens were taken in one dredge haul in 180 to 220 fathoms.

The Tortugas collection contains one specimen, 175 mm. long, which agrees fairly well with Goode and Bean's figure 6 (Ocean. Ichthyol., 1895, p. 16), based on a 150-mm. specimen, except in color. Instead of having separate and varied color markings, it has definite dark blotches, placed essentially like the reticulations shown for a larger specimen in figure 14 of Goode and Bean. The small shark in hand has even a somewhat longer and more sharply pointed caudal than the one illustrated in figure 6 of Goode and Bean, with an uninterrupted fin (subcaudal) underneath.

In color the Tortugas specimen agrees with Miranda Ribeiro's figure of *Catulus haeckelii* (Arch. Mus. nac. Rio de Janeiro, vol. 14, 1907, p. 163, pl. 8), except for the black dots shown in that figure, which, however, also shows a shorter caudal, with an interrupted fin, wherein it agrees with Goode and Bean's figure 14.

Garman (Mem. Mus. Comp. Zoöl., vol. 36, 1913, p. 77) regarded *Catulus haeckelii* Ribeiro as synonymous with *Scylliorhinus boa* Goode and Bean, which he recognized as distinct from *S. retifer*, though Goode and Bean (see citation above) in their final decision expressed doubt whether *S. boa* is even a color variety. Further study of specimens seems necessary to determine the meaning of the differences in the shape of the caudal and in the color.

An inhabitant of deep water in the Gulf Stream, and possibly southward to Brazil. S. F. H.

Family GINGLYMOSTOMIDAE. NURSE SHARKS

Ginglymostoma cirratum (Gmelin)

Dr. Longley stated in his field notes that nurse sharks were seen occasionally, sometimes in schools of as many as 20 or more, and occasionally singly. For further information the reader is referred to Gudger (Copeia, No. 98, 1921,

p. 58), who, reporting investigations made in the Florida Keys, gave a rather full life history of the nurse shark.

Dr. Longley's collection contains 2 embryos: a male, 130 mm. long, with well developed barbels and many jet-black round spots, and a very immature one, 80 mm. long. The smaller embryo, with long, fringelike external gills, already has the characteristic barbels well developed. On the abdomen are prominent cross-grooves, which are visible, but much less prominent, on the larger embryo. The fins are all well developed and occupy the same relative positions as in the adult. The only color markings on the 80-mm. embryo are two or three obscure vertically elongated dusky spots on the lower part of the side.

Of wide distribution; common in the West Indies and on the south Atlantic coast of the United States. S. F. H.

Family CARCHARIIDAE. GRAY SHARKS

Carcharias obscurus (LeSueur)

Dr. Longley's field notes state that 2 specimens, both males, 75 and 135 cm. long, were taken with hooks and lines on a reef, at night.

Inhabits the coast from the middle Atlantic states northward, apparently straying southward. S. F. H.

Galeocerdo tigrinus Müller and Henle. TIGER SHARK; LEOPARD SHARK

Two tiger sharks were taken, one 3 m. and the other 2.4 m. long, both caught off the Laboratory dock.

The larger shark was slaty above, whitish underneath, and the sides from pectoral to base of tail were marked with faint dark vertical bands. The smaller one, a female, had dark spots surrounded by light reticulations. The larger shark had fed on a man-of-war bird and two ham bones.

Known from tropical seas, straying northward. S. F. H.

Scoliodon tærræ-novæ (Richardson). SHARP-NOSED SHARK

This fish was reported from Tortugas by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 232) from a single fetal specimen.

Common on the Atlantic coast of the United States. S. F. H.

Hypoprion brevirostris Poey

Dr. Longley's field notes state that 2 specimens were caught, one 195 cm. and the other 165 cm. long. The 195-cm. shark, after it had been out of the water about 2 hours, was generally ashy gray above and whitish beneath; pectorals white beneath, except for distal third of their length, which was ashy gradually passing into the ventral white; under faces of ventrals of same colors, with upper surface distinctly darker than sides of body above them.

Known from the West Indies and the south Atlantic coast of the United States. S. F. H.

Family SPHYRNIDAE. HAMMERHEAD SHARKS

Sphyrna tiburo (Linnaeus). BONNETNOSE SHARK

This shark apparently is not common at Tortugas, as only 1 specimen, 92.5 cm. long, was taken. The slits of its pupils, like those of the hammerhead, are horizontal, not vertical as in other sharks observed. One uterus contained 4 young and the other 5, each 137 mm. long. The walls of the uteri were thin, vascular, and wrinkled, with the delicate egg membrane enclosing each young fish similarly plaited, its folds fitting so closely within those of the uterus that a perceptible tension was necessary to separate the two. Long villi, close together, formed a fringe upon the entire length of the yolk stalk. The stomach contained an octopus.

The foregoing information is from Dr. Longley's field notes. His collection contains 1 embryo, 220 mm. long.

Reported from both coasts of the Americas and also from the Orient.

S. F. H.

Sphyrna zygaena (Linnaeus). HAMMERHEAD SHARK

This shark, according to Dr. Longley's notes, is rare at Tortugas, as only 2 were observed during many summers at the Laboratory. One specimen, 217 cm. long, taken in a gill net near shore, had a maximum depth of 262 mm.; width of hammer 500 mm.; width of mouth 125 mm. The pupils in this shark, as in the bonnetnose, were horizontal and not vertical as in other sharks observed. The stomach contained the mantle of a large squid, the plates of a trunkfish, and an 85-cm. houndfish.

Reported from both coasts of America, and from the Orient.

S. F. H.

Family SQUALIDAE. DOGFISHES

Squalus acanthias Linnaeus

The Tortugas collection contains 7 embryos, 5 each about 220 mm. in length, and 2 smaller ones, each about 135 mm. long. The characteristic spines in the dorsal fins, even in the smaller embryos, are already fairly well developed.

No data or field notes pertaining to these specimens were found.

Common on both coasts of the north Atlantic, ranging to the West Indies.

S. F. H.

Etmopterus hillianus (Poey)

One specimen in rather bad condition, about 315 mm. long without caudal fin, taken south of Tortugas in 357 to 392 fathoms, was identified by Dr. Longley as this species. Head to first gill opening 64 mm.; depth 64 mm.; eye 13 mm.; snout 22 mm.; snout in advance of mouth 35 mm.; interorbital 20 mm.; width of mouth 22 mm.; length of base of first dorsal 16, second dorsal 23 mm.; length of 1st dorsal spine 10, 2d dorsal spine 20 mm. Snout, in advance of the nearly straight transverse mouth, broad and depressed; first dorsal inserted nearer

pectorals than ventrals; second dorsal well behind ventrals; skin very rough, denticles forming definite longitudinal ridges along the side. Color dark brown to black.

Previously recorded only from the West Indies.

S. F. H.

Family RAJIDAE. SKATES AND RAYS

Raja ornata Garman

This species is not represented in the Tortugas collection. Dr. Longley listed in his field notes 3 specimens from 127 to 290 fathoms, 2 from about 283 fathoms, and 4 from about 200 fathoms.

Known from the southern coast of the United States.

S. F. H.

Raja plutonia Garman

Two specimens, 250 and 265 mm. long, taken in 220 to 237 fathoms, are reported in Dr. Longley's notes. His collection contains another 220 mm. long, which is in entire agreement with Garman's description and figure (Mem. Mus. Comp. Zoöl., vol. 36, 1913, p. 335, pl. 18, fig. 1).

Apparently previously reported only from off the coast of South Carolina.

S. F. H.

Family DASYATIDAE. STING RAYS

Urobatis sloani (Blainville)

The Tortugas collection contains 1 specimen 250 mm. long, having a disk 145 mm. wide and 138 mm. long, with a prominent caudal spine 30 mm. long. This specimen agrees well with Garman's description and figure (Mem. Mus. Comp. Zoöl., vol. 36, 1913, p. 402, pl. 28). I have found no record of it in Dr. Longley's notes.

Occurs in the West Indies and occasionally northward.

S. F. H.

Family MYLIOBATIDAE. EAGLE RAYS

Aëtobatus narinari (Euphrasen). SPOTTED EAGLE RAY

A specimen with a total length of 142.5 cm., width from tip to tip of pectoral 82.5 cm., was observed; another individual was seen twice on Loggerhead reef.

The foregoing is from Dr. Longley's notes. For a full account of the spotted eagle ray, see Gudger (Carnegie Inst. Wash. Pub. 183, 1914, p. 241).

Tropical seas, northward on the Atlantic coast of America at least to North Carolina.

S. F. H.

Family ELOPIDAE. TEN-POUNDERS; TARPONS

Elops saurus Linnaeus. TEN-POUNDER

This species is known from Tortugas from a specimen about 25 mm. long seined in turtle grass in about 3 feet of water on the south side of Garden Key,

recorded by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 232). The adults have not been observed at Tortugas.

Tropical Atlantic, ranging northward to the middle Atlantic states. S. F. H.

Tarpon atlanticus (Cuvier and Valenciennes). TARPON

Seen sometimes about the east lighthouse dock and the shoals south of it; not uncommon about Fort Jefferson. It forages among refuse from the galley, and large ones sometimes herd schooling *Harengula* or *Anchoviella*, taking toll from them at will.

When the very oblique mouth is closed, the fore part of the lower jaw rises nearly vertically in advance of the upper, and for its full width enters the dorsal contour. This triangular part of the tip of this jaw is of the full green color of the back, with which it is perfectly assimilated in the living fish, carrying the dorsal green forward in utter disregard of the oral cleft. Nothing could illustrate more perfectly the fact that fishes are colored as if they had been made first as blanks, and then, without reference to underlying structure, painted as units with adaptive color and shading. The large eye falls below the level of the dorsal green and its iris blends with the silvery side. As seen by the diver this great fish appears unsubstantial, a gray ghost floating in gray water.

Found from middle Atlantic states to Brazil.

W. H. L.

Family ALBULIDAE. LADYFISHES

Albula vulpes (Linnaeus). BONEFISH

Twice young bonefish were seined on Long Key flats, and once leptocephaloid larvae were included. The smallest larva, which was 25 mm. long, was so transparent that the divisions of a ruler were visible through its body, yet the juvenile color pattern was clearly indicated. This pattern consisted of six dark spots along the lateral line; six median spots above them; five dark saddles dividing the interspaces equally; and other spots in series below the lateral line. The youngest larva was 50 mm. long and already had a little pigment along the outer rays of the caudal and along the side of the belly.

Inhabiting tropical seas, ranging northward to middle Atlantic states.

W. H. L.

Family CLUPEIDAE. HERRINGS

Sardinella Cuvier and Valenciennes

Sardinella Cuvier and Valenciennes, Hist. nat. poiss., vol. 20, 1847, p. 261 (*S. aurita* Cuvier and Valenciennes).

Sardinia Poey, Memorias, vol. 2, 1860, p. 311 (*S. pseudohispanica* Poey).

Since 1918 or earlier, when Alvin Seale thought he had discovered that the type of *Sardinia pseudohispanica* Poey preserved in the Museum of Comparative Zoölogy was a thoroughly representative specimen of *Sardina* Antipa, there has been confusion regarding the relations between that genus and the genera *Sardinella* Cuvier and Valenciennes and *Sardinia* Poey. Seale's basic observation

that the alleged type belongs to a species of *Sardina* is correct, and Jordan (Copeia, No. 56, 1918, p. 46), basing his conclusions on Seale's supposed discovery, would have been entirely justified in referring that name to synonymy of *Sardinia* Poey, were it not for a fact to which Hubbs (Proc. Calif. Acad. Sci., ser. 4, vol. 18, 1929, pp. 261-268) has since called attention, namely, that the fish in question cannot possibly be the type of *Sardinia pseudohispanica*, as it is only 85 mm. long, instead of 110 mm., the length originally given. Hubbs pointed out also that its 51 vertebrae exceed by so many the 46 recorded by Poey that it cannot be considered conspecific with the type of *S. pseudohispanica*. He is probably quite correct in assuming that it is not even a West Indian fish. Unfortunately Hubbs' note escaped the attention of the authors of the *Check list* (1930), or failed to meet their approval, and Jordan's earlier error was repeated.

W. H. L.

Sardinella anchovia Cuvier and Valenciennes

Sardinella anchovia Cuvier and Valenciennes, Hist. nat. poiss., vol. 20, 1847, p. 269—Rio de Janeiro; Martinique. Jordan and Evermann, Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 429.

Sardinia pseudohispanica Poey, Memorias, vol. 2, 1860, p. 311—Cuba.

Clupea pseudohispanica Kendall and Smith (part), Bull. U. S. Fish Comm., vol. 14, 1894, p. 17—Woods Hole, Massachusetts.

Clupanodon pseudohispanicus Jordan and Evermann (part), Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 423. Meek and Hildebrand (part), Field Mus. Nat. Hist., Zool. Ser., vol. 15, pt. 1, 1923, p. 180. Beebe and Tee-Van (part), Zoologica, vol. 10, 1928, p. 39.

Sardinella aurita Regan (part not of Cuvier and Valenciennes), Ann. and Mag. Nat. Hist., ser. 8, vol. 19, 1917, p. 378. Jordan, Evermann, and Clark (part not of Cuvier and Valenciennes), Check list, 1930, p. 43.

Sardinia anchovia Jordan, Evermann, and Clark, Check list, 1930, p. 43.

Fishes registered as U. S. Nat. Mus. no. 70086, collected at Woods Hole, Massachusetts, include two species, *Sardinella pseudohispanica* (Poey), = *S. anchovia* Cuvier and Valenciennes, represented by 10 specimens, and *Clupea harengula* by 2. The former at 100 mm. standard length has 79 gill rakers, the latter at the same length has 44. This is apparently the collection, or part of the collection, mentioned by Kendall and Smith in the publication cited above. The identification of all these specimens with *Sardinia pseudohispanica* Poey, together with the facts observed, perhaps explains Kendall and Smith's assignment of Poey's species to the genus *Clupea* as well as their statement that at a specified size it has a number of gill rakers very much smaller than has been noted by other students.

What the relation may be between the Brazilian *Sardinella anchovia* and European *S. aurita* (both of Cuvier and Valenciennes), and between the first and *Sardinia pseudohispanica* Poey, are questions which have been considered repeatedly but are still open. Something may be gained, however, by pointing out that the "types" of *anchovia*, still in Paris in very good condition, are not all of one species.

In table 1 are entered proportional measurements in millimeters and counts of gill rakers for Delalande's, d'Orbigny's, and Gay's specimens mentioned in the

original description of *Sardinella anchovia*; and, for comparison, those of another specimen in the Paris collection, presented by the Museum of Comparative Zoölogy as *Clupea brasiliensis* Steindachner.

The first fish of table 1, first mentioned in Valenciennes' description of *S. anchovia*, may be regarded as the type of that species. The other four are *S. brasiliensis* (Steindachner). *Sardinella anchovia* is much the thicker fish through the humeral region, and, at the only size (116 mm.) at which direct comparison is possible, has from 50 to 70 fewer gill rakers.

Sardinella aurita was described originally from material collected by Bibron at Messina, and by the Commission Scientifique de Morée without precise specification of locality. Bibron's fish, mentioned first, may be regarded as typical, and

TABLE 1

MEASUREMENTS (IN MILLIMETERS) AND GILL-RAKER COUNTS OF *Sardinella anchovia* C. & V. (FIRST SPECIMEN MEASURED) AND *Sardinella brasiliensis* (STD.)

(The numbers in parentheses under "Depth" and "Head" show the number of times those measurements are contained in the standard length. Those under "Thickness" show the number of times that measurement is contained in the head.)

Standard length	Depth	Head	Thickness	No. gill rakers	Collector and locality
116.....	23 (5.0)	28.5 (4.0)	11 (2.6)	105	Delalande, Brazil
114.....	23 (5.0)	30 (3.8)	7 (4.3)	160	D'Orbigny, Brazil
116.....	24 (4.8)	32 (3.6)	8 (4.0)	176	D'Orbigny, Brazil
148.....	34 (4.4)	40 (3.7)	17 (2.4)	178	Gay, Brazil
142.....	35 (4.0)	39.5 (3.6)	16 (2.5)	172	Pres. by Mus. Comp. Zoöl., Rio de Janeiro

are in fact the same as the others. With these belong two obtained at Messina and two in the Museum of Comparative Zoölogy. The last two came, like the others, from Messina, and still another from Nice. Measurements in table 2 permit comparison of *S. aurita* with the two Brazilian species of table 1.

The consistent difference in the number of gill rakers of *S. brasiliensis* and *S. aurita* shows specific difference. And *aurita* and *anchovia* might seem the same, were it not for the difficulty—evident in each table—that the number of gill rakers is not strictly correlated with standard length. That is, individual variation in number of gill rakers is sufficient to mask specific diversity when the number of specimens compared is small.

This species comes to the surface very commonly to a night light in 10 to 20 fathoms at Tortugas. It is very clear dark blue above and silvery on the sides and ventral surface.

Two specimens, respectively 120 and 140 mm. in length, 98 and 112 mm. to base of caudal, had the following proportions: Head 4.0 to 4.2; depth 4.0 to 4.3. Eye in head 4.0. D. 18 or 19; A. 17 to 19; scales about 77, those on sides with vertical striae not quite so strong as in *Harengula maculosa* and *H. macroph-*

thalma; gill rakers 80; scutes 20 + 14 or 15; vertebrae 46; teeth on tongue and palatines similar to those in the other species, but weaker.

Three fish, each about 75 mm. long, were included in refuse from the Bird Key tern rookery; 6, 50 to 63 mm. long, were seined at Long Key or at Garden Key, with *Harengula*, *Jenkinsia*, and *Anchoviella*, and had scutes 18 to 20 + 14 or 15, gill rakers 48 to 53, vertebrae 45 to 47; and scores of colorless young, up to 32 mm. in length, with 22 or 23 gill rakers and 46 or 47 vertebrae, caught about a night light in Bird Key harbor, are believed to be of this species.

Tropical Atlantic shores of America, straying northward to Cape Cod.

TABLE 2

MEASUREMENTS (IN MILLIMETERS) AND GILL-RAKER COUNTS OF *Sardinella aurita* C. & V.

(The numbers in parentheses under "Depth" and "Head" show the number of times those measurements are contained in the standard length. Those under "Thickness" show the number of times that measurement is contained in the head.)

Standard length	Depth	Head	Thickness	No. gill rakers	Collector and locality
257.....				137	Nice
205.....	43 (4.8)	48 (4.3)	21 (2.3)	140	Bibron, Messina
202.....	43 (4.7)	46 (4.4)	21 (2.2)	130	Bibron, Messina
179.....	34 (5.3)	43 (4.2)		120	Benoits, Messina
172.....	34 (5.1)	41 (4.2)		127	Benoits, Messina
164.....	35 ± (4.1)	40 (4.1)	18 (2.2)	130	Bibron, Messina
137.....	28 (4.9)	31 (4.4)	14 (2.2)	116	Comm. Sci. de Morée
101.....	21 (4.8)	26 (3.9)	10.5 (2.5)	95	Comm. Sci. de Morée
90.....	18 (5.0)	23 (3.9)	8 (2.9)	94	Comm. Sci. de Morée
84.....				82 ±	Hackel, Messina
78.....				80 ±	Hackel, Messina

W. H. L.

Harengula Cuvier and Valenciennes, 1847

The West Indian species of this genus are two, though for nearly a century more have commonly been recognized.

KEY TO THE SPECIES

- a. Compressed, greatest thickness contained 2.2 to 2.7 times in depth; scales adherent; eye moderate, in diameter not exceeding its vertical distance above ventral contour of head; gill rakers 29 to 36; ventral scutes usually 17 + 14; vertebrae 41 to 43 *macrophthalma*
- aa. Less compressed, greatest thickness contained about 2.2 times in greatest depth; scales only moderately adherent; eye large, its diameter exceeding its vertical distance above ventral outline of head; gill rakers 27 to 29; ventral scutes usually 17 + 10; vertebrae 40 . . . *maculosa*

W. H. L.

Harengula maculosa Cuvier and Valenciennes

Harengula maculosa Cuvier and Valenciennes, Hist. nat. poiss., vol. 20, 1847, p. 292—Martinique. Longley, Carnegie Inst. Wash. Year Book No. 31, 1932, p. 299.

Alosa apicalis Müller and Troschel, in Schomburgk, Hist. Barbados, 1848, p. 675—Barbados.

Harengula sardina Poey, Memorias, vol. 2, 1860, p. 310—Cuba.

Harengula jaguana Poey, Repertorio, vol. 1, 1865, p. 189—Bahia de Jagua, Cuba.

Harengula callolepis Goode and Bean, Proc. U. S. Nat. Mus., vol. 2, 1879, p. 152—Bermuda.

Sardinella macrophthalmus Jordan and Evermann (part not of Ranzani), Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 430. Evermann and Marsh, Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 85. Metzelaar, Trop. atl. Vissch., 1919, p. 12.

Sardinella apicalis Jordan and Evermann, Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 429.

Sardinella sardina Jordan and Evermann, Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 430. Metzelaar, Trop. atl. Vissch., 1919, p. 11. Meek and Hildebrand, Field Mus. Nat. Hist., Zool. Ser., vol. 15, pt. 1, 1923, p. 183. Beebe and Tee-Van, Zoologica, vol. 10, 1928, p. 40 (figure apparently based on *Harengula macrophthalma* [Ranzani]).

Harengula macrophthalmus Beebe and Tee-Van (not of Ranzani), Zoologica, vol. 13, 1933, p. 136—Bermuda.

Ranzani's name *macrophthalma* led to misunderstanding, because of the subsequent discovery of *Harengula maculosa*, a form with a still larger eye. Cuvier and Valenciennes' *maculosa* has often been registered incorrectly as *macrophthalma*.

The type of *H. maculosa* is not now to be found in Paris, but its 27 ventral scutes, scales with 8 or 9 vertical striae, large eye, and the color markings to which it owes its name identify it. The types or cotypes of other species in synonymy above, all of which I have seen, are representative specimens of this one.

This species may be found in company with *H. macrophthalma* near shore in late June, nearing a breeding condition. A random sample of such fish consisted of 29 females 167 to 213 mm. long and 7 males 165 to 180 mm. long. The proportion of depth to standard length does not differ in the two sexes or within the size ranges represented. Besides large fish, young were taken with the seine at Garden and Long keys, and smaller young about a submerged light at night in the deep holes inside Bird Key reef and in Bird Key harbor.

Over white sandy bottom the coloring is very delicate above in a pattern of mottled pale grays; tip of the lower jaw black, with orange following; some orange on dorsal surface of eye and behind upper margin of gill opening; a streak of bronze extending on row of scales behind gill opening to base of caudal, with paler streaks running on the two rows of scales next below; dorsal and caudal fins dusky.

The vertical striae on the scales are more numerous in this species than in *H. macrophthalma*, there being about 7 on the scales at mid-level on the side below the dorsal fin, and 10 or 11 on those on the sides of the caudal peduncle. In a lot ranging from 165 to 213 mm. in length, the number of striae on the scales from these parts of the body varied little.

Ranging from Bermuda and southern Florida to South America. W. H. L.

Harengula macrophthalma (Ranzani)

- Clupea macrophthalma* Ranzani, Nov. com. Acad. sci. inst. Bonon., vol. 5, 1842, p. 320—Brazil. Günther, Cat. fish. Brit. Mus., vol. 7, 1868, p. 421.
- Harengula clupeola* Cuvier and Valenciennes, Hist. nat. poiss., vol. 20, 1847, p. 289—Guadeloupe. Jordan, Evermann, and Clark, Check list, 1930, p. 43.
- Harengula humeralis* Cuvier and Valenciennes, Hist. nat. poiss., vol. 20, 1847, p. 293—Rio de Janeiro; Bahia; Guadeloupe; Santo Domingo. Longley, Carnegie Inst. Wash. Year Book No. 31, 1932, p. 299.
- Alansa striata* Cuvier and Valenciennes, Hist. nat. poiss., vol. 20, 1847, p. 429—Guadeloupe; Bahia.
- Alosa bishopi* Müller and Troschel, in Schomburgk, Hist. Barbados, 1848, p. 675—Barbados.
- Harengula dubia* and *H. clupeola* Poey, Repertorio, vol. 2, 1868, p. 418—Havana.
- Clupea humeralis* Günther, Cat. fish. Brit. Mus., vol. 7, 1868, p. 422.
- Harengula pensacolae* Goode and Bean, Proc. U. S. Nat. Mus., vol. 2, 1879, p. 152—Pensacola, Florida. Regan, Ann. and Mag. Nat. Hist., ser. 8, vol. 19, 1917, p. 389. Jordan, Evermann, and Clark, Check list, 1930, p. 44.
- Sardinella clupeola* Jordan and Evermann, Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 429. Metzelaar, Trop. atl. Vissch., 1919, p. 11.
- Sardinella bishopi* Jordan and Evermann, Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 430.
- Sardinella macrophthalmus* Jordan and Evermann (part), Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 430. Meek and Hildebrand, Field Mus. Nat. Hist., Zool. Ser., vol. 15, pt. 1, 1923, p. 184. Breder, Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 12. Parr, Bull. Bingham Oceanog. Coll., vol. 3, art. 4, 1930, p. 3. Beebe and Tee-Van, Zoologica, vol. 10, 1928, p. 41 (figure apparently based on *Harengula maculosa*).
- Sardinella humeralis* Jordan and Evermann, Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 431. Metzelaar, Trop. atl. Vissch., 1919, p. 11.
- Sardinella anchovia* Metzelaar (part), Trop. atl. Vissch., 1919, p. 10, fig. 2.
- Harengula macrophthalma* Regan, Ann. and Mag. Nat. Hist., ser. 8, vol. 19, 1917, p. 388. Longley (part), Carnegie Inst. Wash. Year Book No. 31, 1932, p. 299. Jordan, Evermann, and Clark, Check list, 1930, p. 43.

Fish taken near the Laboratory in late June had not quite attained sexual maturity. In a sample of 50, taken at random, were 21 males and 29 females, the former 155 to 175 mm. long, the latter 155 to 193 mm. The sexes differ in the ratio of depth to length: the females are deeper than the males, the depth of the adult females being contained about 2.8 times in the standard length, and that of the males about 3.0 times. After little practice it was possible to separate them with an error not over 10 per cent, the smaller fish creating the difficulty.

Common along shore and about the wharves of Garden Key during summer, the larger ones schooling chiefly with their own kind, the young frequently with *Jenkinsia* and *Anchoviella*. Specimens have been identified also in the catch of terns breeding on Bird Key.

In 20 specimens, 88 to 113 mm. long, the dorsal rays vary from 17 to 19; anal rays 16 to 19, the last ray in each fin being double; the commonest combination being D. 18, A. 18, which occurred in 11 of 20 specimens. Four specimens, 31 to 38 mm. long, had 17 + 14 scutes; 8 specimens, 88 to 113 mm. long, had 17 + 13; of the larger specimens, 125 to 143 mm. long to base of caudal, 5 had 18 + 13 scutes and 1 had 17 + 12. Specimens 31 to 44 mm. long had about 28 to 33 gill rakers; and larger specimens, ranging upwards of 125 mm. in standard length,

had about 29 to 36 gill rakers. Scales adherent, about 41 in a lateral series. In comparison with *Harengula maculosa*, the eye is smaller, the ventral outline is more convex, and the branches of the striae in the occipital, being about 7 in number, are fewer.

W. H. L.

Since Dr. Longley wrote the foregoing accounts of the species of the genus *Harengula*, a paper has been published by Margaret Storey, entitled "West Indian clupeids of the genus *Harengula* with notes on *H. thrissina* from the Pacific" (Stanford Ichthyol. Bull., vol. 1, no. 1, 1938, pp. 3-56, 17 figs.), wherein the author has brought forward the name *Clupea clupeola* Cuvier (Règne animal, 2d ed., vol. 2, 1829, p. 318, n. 2), which she claims has priority over *C. macrophthalma* Ranzani. Miss Storey recognizes *H. pensacolae* Goode and Bean as a distinct species, whereas Dr. Longley considers it a synonym of his *H. macrophthalma*. For the species designated *H. maculosa* Cuvier and Valenciennes by Dr. Longley, Miss Storey again went back to the work of Cuvier cited above (p. 318, n. 2) for an older name, *Clupea humeralis*, which according to her is not *H. humeralis* Cuvier and Valenciennes.

Miss Storey, furthermore, described a new species, *H. majorina*, to the synonymy of which she doubtfully assigned *H. humeralis* Cuvier and Valenciennes. This species, though occurring in the West Indies, seems to be of southern distribution, ranging to southern Brazil. Miss Storey refers to this species as "a deep-bellied, silvery fish, with a convex ventral outline, especially notable in larger specimens; short, deep head, and moderately large eye." Considerable overlapping with the other species recognized is evident, however, from the statistics furnished.

Miss Storey apparently did not recognize a difference in the depth of the body between males and females of her *H. clupeola*, which in part at least is Dr. Longley's *H. macrophthalma*. The comparatively great difference in depth of the sexes, discovered by Dr. Longley, was verified by me from a rather large number of specimens from Tortugas. According to Dr. Longley's studies, however, the proportion of depth to standard length does not differ in the sexes of his *H. maculosa*.

It is well known that in clupeid fishes having a rather high number of gill rakers, the number increases with age. Thus, Dr. Longley has pointed out that specimens of *H. macrophthalma* 31 to 44 mm. long had about 28 to 33 rakers on the lower limb of the first arch, whereas larger specimens, ranging upwards of 125 mm. in length, had about 29 to 36, a difference which does not seem large in this species. Though Miss Storey did not use very small specimens, none under 42.3 mm. in standard length, except of *H. pensacolae*, it apparently would have been helpful if she had stated the differences, if any, in number of gill rakers in specimens of different lengths. In the account of *Sardinella anchovia* Dr. Longley has shown a great difference in the number of gill rakers between small and large specimens.

Ranging from the southern shores of the United States probably to Brazil.

S. F. H.

Family DUSSUMIERIIDAE. ROUND HERRINGS

Jenkinsia lamprotaenia (Gosse)

Clupea lamprotaenia Gosse, A naturalist's sojourn in Jamaica, 1851, p. 291, pl. 1, fig. 2—Jamaica.

Dussumieria stolidifera Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 7, 1884 (1885), p. 25—Key West, Florida.

The nominal species *stolidifera* was described by Jordan and Gilbert as differing principally in the number of dorsal and anal rays; as the authors stated, "We should identify our specimens with *Clupea lamprotaenia* Gosse, from Jamaica, were it not for the difference in the number of fin rays." Beebe and Tee-Van (Zoologica, vol. 10, 1928, p. 44) already have pointed out that in specimens from Haiti the fin-ray counts come within the range of either species, the range given by them being 11 to 13 rays for the dorsal and 14 to 17 for the anal. In 44 specimens from Tortugas the range is extended still farther, as 9 to 12 rays have been counted in the dorsal and 11 to 16 in the anal. In 3 specimens from Key West, the type locality, we count 12 and 13 rays in the dorsal, whereas the type was described as having 11 rays; and the anal has 14 or 15 rays instead of 17 in the type, which upon re-examination, however, appears to have only 15. The rays sometimes are difficult to enumerate, and therefore the wide range may result in part from errors in counting.

The depth also is variable, as in 17 specimens from Tortugas the greatest depth is contained from 5.3 to 6.8 times in the standard length; diameter of eye equal to or more usually a little greater than length of snout, being contained 2.75 to 3.3 times in head; origin of dorsal sometimes equidistant from tip of snout and base of caudal, but oftener nearer the former; ventrals inserted somewhere under base of dorsal, usually under 4th to 8th ray. The range in the fin-ray counts and proportions, then, is such that the supposed differences between *lamprotaenia* and *stolidifera* are blotted out. Therefore, we confirm Beebe and Tee-Van's (Zoologica, vol. 10, 1928, p. 43) finding, namely, that *stolidifera* is a synonym of *lamprotaenia*, a decision arrived at also by Parr (Bull. Bingham Oceanog. Coll., vol. 3, art. 4, 1930, p. 3).

Dr. Longley's notes state: "Exceedingly common at Tortugas, particularly along shore, where predacious fishes often drive them too close for safety, and large numbers are cast upon the windward beaches to spring about until a wave rescues them, or until they perish.

"The color is faintly greenish dorsally and the sides have a distinct lateral silvery band."

Known from the Gulf of Mexico and the West Indies.

S. F. H.

Family ENGRAULIDAE. ANCHOVIES

Anchoviella hepsetus (Linnaeus)

Rarely more than a few fish were seen together, but once a great school 50 feet in diameter was observed west of Fort Jefferson. Several tarpon and a multi-

tude of young barracudas were with them, and the former at least were feeding upon them. Females contained large eggs, and in a sample of unknown size the fin formulas were: D. 13 or 14; A. 22 or 23. In another sample of 13 the variation in anal rays was 23 to 28. In still another sample of 10, the counts were: D. 14½ to 16½; A. 22½ to 26½. All the following statements are based on the last-mentioned sample, which seems more like *Anchoviella epsetus* than any other described species. That the other records refer to the same species is not absolutely certain.

Measurements of 2 84-mm. specimens agreed, as follows: Standard length 69 mm.; depth 15 mm.; head 19 mm.; eye 5 mm.; snout 4.5 to 5 mm.; maxillary obliquely truncate, pointed, extending almost to opercular border; gill rakers 17 to 20; scales 41 or 42; axillary scale of pectoral half the length of the fin; pectoral failing by half the orbital width to reach ventral insertion; ventrals inserted midway between pectoral base and anal origin; anal origin under end of dorsal; dorsal origin equidistant from anterior margin of orbit and caudal base.

W. H. L.

Dr. Longley has indicated that he was not satisfied with the identification of his material. Being engaged in a special taxonomic study of American anchovies, I believe Dr. Longley's doubt well founded. Although only one species is included in the material preserved (and identified as *A. epsetus* by Dr. Longley), another related species occurs there; neither of these is *A. hepsetus*, and one may prove to be an unnamed species.

Range extending from New England to somewhere in South America.

S. F. H.

Anchoviella perfasciata (Poey)

Seined occasionally with *Anchoviella epsetus*, *Harengula maculosa*, *H. macrophthalma*, and *Jenkinsia lamprotaenia*, all of which are more common.

Four specimens examined agreed in having 15½ dorsal and 18½ anal rays, except that one had an anal ray less. Poey's record (*Memorias*, vol. 2, 1860, p. 313), stated comparably, is D. 14; A. 17. Jordan and Evermann's (*Bull. U. S. Nat. Mus.*, No. 47, pt. 1, 1896, p. 441) is D. 12; A. 14 to 16.

A specimen 75 mm. long, 65 mm. to base of caudal, has a depth of 11 mm.; thickness 6 mm.; head 16 mm.; eye 4 mm.; greatest breadth of lateral stripe 4 mm.; snout 3 mm. This is consistent with Poey's description. Scales about 46; gill rakers 25 to 27; posterior end of maxillary rounded, reaching only to posterior margin of preopercle. Pectoral short, about 1.5 times orbital diameter, little longer than axillary scale, reaching halfway to ventral insertion; ventral insertion a little in advance of dorsal origin; dorsal origin midway between snout and base of caudal; last dorsal ray reaching beyond vertical of anal origin. W. H. L.

The number of gill rakers, 25 to 27, given by Dr. Longley is somewhat disturbing. In 5 specimens in his collection I have counted 22 to about 25 on the lower limb of the first arch, the highest count being doubtful because of the bad

condition of the specimen upon which it is based. Five others from Tortugas (U. S. Nat. Mus. nos. 61124 and 68600) have 20 to 24, and 4 from Key West (no. 35158) have 21 to 24. The number counted by me, with one exception, is lower than in 14 West Indian specimens examined, which have 25 to 28. Dr. Longley's counts, however (which may not be based on the specimens preserved), come within the range of the West Indian specimens. The wide range in the counts of Tortugas and Key West specimens (including Dr. Longley's counts) suggests more than one species, but the material at hand is not sufficient to make a definite determination.

Range, probably Florida and the West Indies.

S. F. H.

Family ALEPOCEPHALIDAE

Xenodermichthys copei (Gill)

Two specimens, 125 and 130 mm. long, taken in 250 fathoms, apparently belong to this species. These specimens, which are not in good condition now, are listed in Dr. Longley's field notes as doubtfully of this species, but without further comment.

The characters that can be checked seem mostly to be correct for *Xenodermichthys copei*. That species, however, is said to have no lateral line, which seems to be present in the specimens from Tortugas, as a double row of short tubes is definitely present underneath the skin. Furthermore, the dorsal and anal fins have been described as of about equal length, whereas the latter in the specimens at hand appears to be the shorter, and with fewer rays. Because of the soft and somewhat torn condition, it is possible that part of the fin is missing.

Caudal fin definitely forked; pectorals placed very low, and immediately behind gill opening; ventrals abdominal, inserted about an eye's diameter in advance of dorsal; gill rakers well developed, 16 on lower limb of first arch; teeth apparently present only on jaws, minute and pointed.

The following proportions are based on the smaller and better specimen at hand: Head 4.3; depth 5.7. The large eye 2.8 in head; snout about 7; maxillary extending slightly beyond middle of eye, 2.5 in head. D. 32; A. 20.

The color of the specimens at hand is uniform dark brown to nearly black.

Few specimens have been reported. Besides the type, which is from the Gulf Stream, at 37° 12' N., 69° 39' W., I have found records of only 3 others, all from the vicinity of Bermuda. The specimens heretofore reported were taken in much deeper water than the Tortugas material.

S. F. H.

Family ARGENTINIDAE

Argentina striata Goode and Bean

No specimens were found in Dr. Longley's collection. In his notes, however, he listed 15 specimens, taken in 160 to 197 fathoms, the largest one being 190 mm. long.

General range, the Gulf of Mexico.

S. F. H.

Family MELANOSTOMIATIDAE

Echiostoma barbatum Lowe

Dr. Longley in his notebook listed a blackfish 87 mm. long, taken in 367 to 375 fathoms, described as having a barbel under chin, reaching slightly beyond base of pectoral, with a cylindrical stalk, its tip bulbous, 1.5 times as long as wide, and pale green; a flattened element with semicircular outline (flat distally) connected with its tip, bearing four lateral threadlike branches at base, each thread being rather larger than half the flat edge from which they spring, and bulbous at tip; this element and distal bulbs rosy. Pectoral divided; lower 3 rays short and united about two-fifths of their length to upper long part, composed of about 6 rays; ventrals abdominal, with 8 rays; D. about 11; A. 16; both dorsal and anal reaching almost to caudal.

Dr. Longley was uncertain as to the identification. In his collection is a specimen 80 mm. long, which may be the one described by him, though now 7 mm. shorter. I have compared the Tortugas specimen with others in the National Museum, as well as with the recent literature, and am confident that the Tortugas fish are identical with American specimens generally identified as this species. I follow Parr (Bull. Bingham Oceanog. Coll., vol. 3, art 2, 1927, p. 53) in placing this genus and species in the family Melanostomiidae.

Recorded from Madeira and Massachusetts, and southward in the Gulf Stream.
S. F. H.

Family GONOSTOMIDAE

Yarrella blackfordi Goode and Bean

Dr. Longley listed in his notes 2 specimens, each about 220 mm. long, which were taken in 367 to 375 fathoms. A third specimen, 78 mm. long to base of caudal, in damaged condition, is in the Tortugas collection. The following proportions are based on this fish: Head 4.0; depth 6.1. Eye in head 4.25; snout 4.75; interorbital 6.75; maxillary 1.3; caudal peduncle 3.9. Body moderately strongly compressed, tapering rather sharply toward tail; pectorals placed low, under margin of opercle; ventrals very close together, inserted about an eye's diameter in advance of dorsal; anal beginning somewhat posterior to middle of base of dorsal. D. 13; A. about 25 (damaged); P. 8; V. 6; gill rakers 13. The photophores, which are confined to the ventral surface, essentially agree in position and number with the type, with which the Tortugas specimen was compared. The maxillary reaches far beyond the eye, and is much longer than the post-orbital part of the head, both in the type and in the Tortugas specimen, contrary to the statement in the original description. The lower jaw projects sharply, and is bent upward anteriorly.

Inhabits deep water of the Gulf Stream.

S. F. H.

Cyclothone microdon (Günther)

I find no specimens among the Tortugas material, and only the following in Dr. Longley's notes: Two specimens, each about 50 mm. long, taken in 367 to

375 fathoms. D. 14; A. 15; P. 8. Body very delicate, translucent, covered with dusky chromatophores, larger on sides than on back or belly. Nine phosphorescent organs on branchiostegal membrane, just within mandibular margin; a row of 32 on each side of mid-line, from throat to base of caudal; several before pectoral small and closer together; another row of 8, extending from pectoral region almost to vertical from anal.

Body much compressed; ventrals abdominal, reach origin of anal; caudal forked.

Widely distributed in the Atlantic, Pacific, and Antarctic oceans. S. F. H.

Family STERNOPTICHIDAE

Sternoptix diaphana Hermann

The Tortugas collection contains a single specimen, 40 mm. long, which is without data. It probably was taken in one of the deep-water hauls made south of Tortugas. Although a few specimens have been taken at the surface, it is essentially a deep-water fish, having been reported from depths as great as 2500 fathoms. The specimen from Tortugas agrees well with the description and figures of Goode and Bean (*Ocean. Ichthyol.*, 1895, p. 124, figs. 146, 146*b*).

Gulf Stream, from New England southward.

S. F. H.

Argyrolepecus amabilis (Ogilby)¹

The Tortugas collection contains 2 specimens, 44 and 58 mm. long to base of caudal, which are in rather poor condition and are without a locality label. I have found no reference in Dr. Longley's notes identifiable with these specimens. It may be assumed, however, that they were taken in deep water south of Tortugas.

Widely distributed, occurring in the Atlantic and Indian oceans and elsewhere.

S. F. H.

Family SYNAPHOBANCHIDAE

Synaphobranchus kaupii Johnson

This common deep-water eel is represented in the Tortugas collection by 2 specimens, 350 and 455 mm. long, both without specific data, though undoubtedly taken in deep water south of Tortugas. The condition of the larger specimen indicates that it may have been recovered from the stomach of another fish.

Body compressed throughout; head and trunk proportionately short, about 4 in total length; snout long, pointed, ending in a fleshy tip; eye moderate, lateral, about half as long as snout; mouth very large, horizontal, gape reaching an eye's diameter beyond eye; teeth in jaws in bands, upper jaw anteriorly with small recurved canines; vomer with a single series of teeth; gill slits ventrally placed, just in advance of base of pectorals; origin of dorsal far behind vent, distance

¹ This identification is by L. P. Schultz, of the U. S. National Museum, who has made a special study of the genus. For the synonymy and a key to the species of this genus, see his paper, *Proc. U. S. Nat. Mus.*, vol. 86, 1938, pp. 145-147, 150.—S. F. H.

from tip of snout to its beginning 2.5 in total length; pectorals long, slender, about equal to eye and snout.

General color brownish; branchiostegal region blackish; peritoneum jet black, this black showing around vent.

Widely distributed in the north Atlantic and western Pacific. S. F. H.

Family CONGRIDAE. CONGER EELS

Promyllantor schmitti Hildebrand

Promyllantor schmitti Hildebrand, in Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 226, fig. 1—Tortugas, Florida, 350 fathoms.

Family ECHELIDAE. WORM EELS

Myrophis Lütken, 1851

We follow Parr (Bull. Bingham Oceanog. Coll., vol. 3, art. 4, 1930, p. 8) in considering *Ahlia* Jordan and Davis a synonym of *Myrophis*. The discovery of some new species narrowed the distinction between the two genera to the presence or absence of vomerine teeth (which Parr thought might prove to be related to age), *Ahlia* supposedly differing from *Myrophis* in the absence of vomerine teeth. It is exceedingly difficult to be certain of the presence of vomerine teeth in some of the specimens at hand, especially the juveniles. Apparently no useful purpose would be served by basing genera on such an uncertain character.

S. F. H.

Myrophis egmontis Jordan

The data that follow were extracted from Dr. Longley's notes: One specimen, 382 mm. long, was taken in 10 to 12 fathoms, at the entrance of the southwest channel; 2 more were caught during night fishing under a light, drifting up channel next to Loggerhead Key; and 2 more near the Laboratory, one in about 20 fathoms and the other in about 15 fathoms. At another time during night fishing over "Middle Hole" a "number of myrids, 60 to 65 mm. long" were taken. These juveniles seemed transparent when caught, but on preservation they were finely punctulate with dark dots on the dorsal surface.

Four of the small specimens mentioned were preserved and examined by me. They are more slender (wormlike) than larger ones, the greatest depth being only about 2 mm. in a specimen 60 mm. long, and the pectoral fin, though broad, seems proportionately shorter than in larger specimens. It seems probable, nevertheless, that these specimens belong to this species.

Three larger specimens, respectively 215, 255, and 270 mm. long, are included in the Tortugas collection. Pectoral fin short and broad, about as long as snout and broader than gill slit, inserted immediately behind the gill opening; origin of dorsal a little behind that of anal, which begins immediately behind vent; these fins very low and confluent with caudal. The following proportions are based on the 3 specimens mentioned: Distance from snout to dorsal 2.1 to 2.5 in

total length; distance from snout to vent 2.3 to 2.6; head to gill opening 11.5 to 13. Depth 2.6 to 3.0 in head; eye about 10 to 12; snout 5.75 to 7.0; pectoral 6.0 to 9.0.

Known from the Florida Keys.

S. F. H.

Family OPHICHTHYIDAE. SNAKE EELS

Myrichthys acuminatus (Gronow)

This eel is recorded from Tortugas (Garden Key) from a single specimen 450 mm. long, by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 233). It apparently was not taken by Dr. Longley.

The species is recognized by its long, cylindrical shape, with pointed finless tail; by its blunt teeth; by the origin of the dorsal over the head in advance of the gill opening; and by the two series of round, whitish blotches (more or less yellowish in life) on the side of the body and on the head.

West Indies, northward to Florida.

S. F. H.

Family MURAENIDAE. MORAYS

Gymnothorax moringa (Cuvier). COMMON SPOTTED MORAY

This eel was seen and trapped from time to time around the coral heads. A specimen 925 mm. long was described by Dr. Longley (notes) as having powerful jaws, with a structure permitting the mouth to be greatly extended; teeth sharp, those in posterior part of jaws compressed and directed backward.

Ground color yellow, approaching citron yellow on dorsal part of body, and particularly on dorsal fin; this color laterally passing into a primrose yellow, continuous on belly; the lighter ground color with spots of brown like raw umber, these patches marked with lines of seal brown, more or less crosshatched on spots of anterior third of body except on head, parallel and vertical on rest of body except on posterior fifth, where distinction is less evident; brown spots largely of two sizes, smaller ones more or less confluent, and tending to reduce the ground color to mottling. Anterior third of dorsal fin margined with black, the black border posteriorly interrupted; margin of tail almost white.

A juvenile, 95 mm. long, probably of this species, was described (field notes) by Dr. Longley as dark brown in life, marked obscurely with yellow, the most conspicuous marking being the white lower jaw; mouth pigmented within; teeth simple, sharply pointed, biserial in each jaw, though anteriorly only in lower jaw, those in inner row enlarged and depressible; vomer with several very large depressible teeth; eye nearer tip of snout than angle of mouth, contained nearly 2 times in snout.

Gudger (Carnegie Inst. Wash. Pub. 391, 1929, p. 154) reported on specimens taken at Tortugas, describing principally their breathing and feeding in aquaria.

On the Atlantic coast of tropical America, ranging northward to Florida.

S. F. H.

***Gymnothorax funebris* Ranzani. BLACK MORAY**

This moray was seen from time to time on the coral reefs, and one specimen was taken at night. The largest one captured was 157.5 cm. long and weighed 27 pounds.

The specimens taken disagree with Jordan and Evermann's description (Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 396) in that the mouth is completely closing, and furthermore in that they lack longitudinal dark lines on the dorsal and anal fins.

Once small gobies (*Elacatinus*) were observed on a reef creeping across the oral cleft of *Gymnothorax funebris*, but not into it. W. H. L.

Gudger (Carnegie Inst. Wash. Pub. 391, 1929, p. 154), working at Tortugas, gave a full description of the teeth, the structure of the mouth, and the action in breathing. He also described and figured some of the internal organs.

Tropical America, occasionally northward to Florida.

S. F. H.

***Gymnothorax vicinus* (Castelnau). PURPLE-MOUTHED MORAY**

This eel apparently is rare at Tortugas, as only 1 or 2 are reported as seen and taken. Gudger (Carnegie Inst. Wash. Pub. 391, 1929, p. 153), who first reported this tropical moray from Tortugas, had 3 specimens. Dr. Longley described a specimen in his notes as follows: Tail about 1.5 times rest of body; head not quite half trunk; eye 2.0 in snout; cleft of mouth 2.5 in head; teeth entire, 5 large and 18 small on each side of lower jaw, 3 large depressible ones on vomer; mouth not quite capable of being closed in a specimen 60 cm. long.

Dr. Longley described the color as nearly plain brown, with fine freckles of darker brown or purple, and with fine reticulations of yellow, most noticeable on upper half of dorsal fin; dorsal dark, with black longitudinal lines, and a conspicuous white margin; anal with submarginal black, followed distally by a white line; a dark spot, smaller than eye, along posterodorsal margin of gill opening; angle of mouth dusky.

A single juvenile, 110 mm. long, was found in the collection. In this specimen, the head and trunk are contained 2.7 times in the tail; head 3.1 in length to vent; snout short, 8.5 in head; eye about 1.5 in snout; teeth apparently uniserial, with some large depressible ones on vomer; general color of this preserved specimen brownish, with indistinct darker markings.

Tropical Atlantic, straying northward to the Florida Keys.

S. F. H.

***Gymnothorax ocellatus* Agassiz. SPOTTED MORAY**

A specimen 580 mm. long was taken south of Tortugas, in 45 to 60 fathoms. Pre-anal length 264 mm.; depth behind head 46 mm.; head 67 mm.; oral cleft 29 mm.; snout 14 mm.; eye 5.0 mm. Teeth in a single series in either jaw, none on vomer; lower teeth shorter and stouter, except 2 or 3 anteriorly, than upper ones; larger teeth in either jaw serrate, more strongly on posterior margin and toward base.

Color very pale olive, except on dorsal and anal fins and posterior quarter of tail, where ground color is black; much spotted, spots on sides of trunk circular, about one-third of pupil in diameter, and exceedingly pale blue, spots much smaller on upper side of head, larger along base of dorsal fin, fewer and fainter on dorsal and toward lower part of side; largest and whitest on tail, where a series of half a dozen widely separated elliptical spots exceed long diameter of eye considerably.

W. H. L.

The species evidently is rare at Tortugas, whence it has not been reported previously. Tropical America, northward to Florida.

S. F. H.

Family SYNODONTIDAE. LIZARD FISHES

Trachinocephalus myops (Forster)

Not taken commonly, but probably not rare. A small specimen was seined near Long Key; another, 202 mm. long, was caught in the 11-fathom channel west of White Shoal; and larger ones were seen, and some speared, north of Loggerhead Key. As observed there with the diving hood, the species lies much the larger part of the time hidden in the sand, into which it sinks, and is lost to sight in the instant one glances away and turns in its direction again.

In a specimen 202 mm. long, the standard length is 173 mm.; depth 31 mm. (5.5); head 45 mm. (3.84). Eye 7.0 mm. (6.43 in head); snout 5.0 mm., which equals interorbital space and is 9.0 in head. D. $14\frac{1}{2}$; A. $16\frac{1}{2}$; scales 4-58-7. Teeth in 2 series above, 3 below, little if at all compressed, very slightly incurved at tip, outer for the most part firmly rooted, inner depressible; present on tongue, on ventral branchial elements, and in two very closely approximated series on palatines. Anal nearer to pectoral origin than to base of lower caudal rays.

The basic pattern consists of longitudinal stripes of pale blue and yellow, in average width roughly equal to the diameter of the pupil; the most conspicuous blue one extending from upper margin of opercular cleft to upper base of caudal; five yellow and four blue lines, growing fainter ventrally, below it; upper two stripes and broadest yellow ones anteriorly divided by blue penciling; another blue line above these, more on arch of back and on side of mid-line, between two yellow stripes; these much broken and tending strongly to form merely a spotted and streaked pattern, separated on back and sides by hair lines of dusky pigment; basal half of dorsal fin faintly striped across rays with four or five lines of the two dominant body colors; twelve major bars, lighter and darker alternately, superimposed on design of stripes; a dark streak before eye across oral cleft to mandible; and a conspicuous black humeral spot, partly covered by opercular margin. The shade as a whole is decidedly changeable.

W. H. L.

This genus, including a single species, is readily recognized among Tortugas fishes by the very anterior position of the eyes, the snout being much shorter than the eye. Pectorals short, about 2.5 times in much larger ventrals; head somewhat

compressed; interorbital concave; bony ridge over anterior part of eye serrate; lower jaw slightly shorter than upper; teeth not large.

Tropical western Atlantic, northward off the south Atlantic coast states.

S. F. H.

Synodus poeyi Jordan

One specimen from 13 to 15 fathoms, east of Bush Key, and a dozen from depths between 39 and 55½ fathoms, south of Tortugas. The smallest (105 mm.) sexually mature in late August.

In a specimen 123 mm. long, 104 mm. to base of caudal, the proportionate measurements are: Depth 16 mm. (6.5); head 27 mm. (3.9). Eye 6.0 mm. (4.5 in head); interorbital width 5.0 mm. (5.4); snout 7.0 mm. (4.4). Six specimens all have the fin formulas D. 11½; A. 10½, except one which has 1 anal ray more. Second dorsal ray reaching beyond end of base of fin, almost as far as 11th; scales 3 or 4-45-5, 3 rows between adipose fin and lateral line; teeth in 2 rows in upper jaw, 3 in lower, outer fixed, remainder depressible, slight, compressed, slightly barbed; 3 rows on tongue, the outer larger; teeth also present on basipharyngeals; and 2 rows on palatines, the inner larger.

Rather pale in color, almost translucent, silvery on the sides, faintly yellow above. The largest specimens with seven diamond-shaped spots with light centers on lateral line; spots of solid color below the diamond-shaped spots, and alternating with them; a dark saddle at dorsal origin, another at tips of dorsal rays, at adipose fin, and at base of caudal; dorsal and upper caudal lobe faintly cross-barred.

West Indies to Florida.

W. H. L.

Synodus intermedius (Agassiz)

This species was collected at depths as great as 60 fathoms; 14 specimens, 170 to 215 mm. long, in one haul at 40 fathoms. Large specimens are sometimes found also in shallow water.

General color grayish above and silvery below; sides with a series of ten contiguous diamond-shaped spots from level of eye to base of caudal, the alternate ones being connected with blotches on back, carrying the color to the other side in a series of irregular bands; the first band being before the pectorals, and suggestions of fainter bands between the more outstanding ones; a dark shoulder spot, partly concealed by the opercle.

W. H. L.

Norman (Proc. Zool. Soc. London, 1935, p. 104) expressed some doubt as to the distinctness of this species and *Synodus poeyi*, suggesting that the latter might prove to be the young of the former. There are now at hand specimens from Tortugas of nearly equal size for comparison, which show beyond reasonable doubt that the two are distinct. The scales in *S. intermedius* are firm and adherent, whereas they are largely lost in specimens of *S. poeyi*. The difference in the tip of the lower jaw, pointed out by Norman, holds for small specimens, the fleshy knob at the tip of the jaw in *poeyi* being missing in *intermedius*. Al-

though the shape of the dorsal fin is rather variable in *poeyi*, yet in every specimen examined the anterior rays reach beyond some of the succeeding ones, but not always past the last ones if the fin is laid back; whereas in *intermedius* none of the rays reach beyond the tips of the succeeding ones.

The eye is smaller in *S. intermedius*: in 2 specimens of each species of nearly equal length, it is contained in the head 5.3 (118-mm. specimen) and 5.2 (54-mm. one) times in *intermedius*, whereas in *poeyi* it is contained 4.4 (110-mm. specimen) and 3.6 (87-mm. one) times. Furthermore, a dark shoulder spot is always present even in the smallest *intermedius* (54 mm.), whereas it is missing in all specimens of *poeyi*.

Ranging from Florida to Brazil.

S. F. H.

Synodus synodus (Linnaeus)

A single specimen, 213 mm. long, from a depth of 13 to 15 fathoms, east of Bush Key and Bird Key reef. The proportionate measurements of this specimen are: Standard length 182 mm.; approximate depth 22 mm. (8.8); head 41 mm. (4.44). Eye 7.0 mm., equal to interorbital width (6.0 in head); snout 11 mm. (3.7); intermaxillary 26 mm. (1.6). D. 11; A. 12. Pectoral 3.4 in head, reaching origin of ventral; ventrals not reaching halfway to anal origin; distance from anal origin to base of lower caudal rays half the distance from vertical of anal origin to mid-point in length of pectoral; scales 5-57-7, firm, smooth, slightly elevated along lateral line, but forming no true keel, 6 rows on cheek, 4 rows in oblique series between adipose fin and lateral line. Teeth in 2 rows in upper jaw, 3 in lower, much compressed, slightly incurved at tip, distinctly barbed, lateral teeth in outer series largely fixed, others depressible, depressible teeth on tongue, lower pharyngeals, and palatines, the last in 4 series, the inner stoutest but much less so than in *Synodus foetens*.

Dorsal surface finely mottled with gray on pale brown ground color; with indications of nine spots equally spaced on lateral line, alternating with as many vague saddles above.

W. H. L.

According to Norman (Proc. Zool. Soc. London, 1935, p. 109), this species occurs on both sides of the Atlantic, as he gave as the habitat "Madeira and the Canary Islands; Atlantic coast of Tropical America from the West Indies to Bahia."

S. F. H.

Synodus foetens (Linnaeus)

This species occurs in the deep channels within the lagoon, and may be taken commonly also, up to the length of about 125 mm., on the sandy flats about Long Key and Bird Key reef.

In a specimen 212 mm. long, standard length 185 mm., the proportionate measurements are: Depth 22 mm. (8.4); head 45 mm. (4.1); snout 14 mm. (3.2 in head). Eye 7.0 mm. (6.5 in head); interorbital space 8.0 mm. (5.6); intermaxillary length 33 mm. (1.34). Pectoral scarcely longer than dorsal base and equal to that of anal; ventrals reaching more than halfway to anal origin. D.

11½; A. 11½; scales 6-58-8, 7 rows on cheek, 5 in an oblique row between adipose fin and lateral line. Teeth in upper jaw in 2 series, 3 in lower, which is included, depressible teeth on tongue and lower pharyngeals, and in as many as 4 series on palatines.

Ground color in a half-grown specimen creamy white to pale gray; dorsal surface crossed by eleven brownish bands or blotches equally spaced, the first between the eyes, all double except the last, at base of caudal; ten diamond-shaped spots with lighter centers along lateral line at distances from one another equal to their own breadth; a second series of lighter shade and solid color below these and alternating with them. Dorsal and caudal fins and proximal half of pectoral of same color as body; other fins transparent.

The experiment of putting fish in black and in white dishes showed that they readily adjust their shade to that of their surroundings.

Ranging from Cape Cod to Brazil.

W. H. L.

Saurida Cuvier and Valenciennes, 1849

This genus has not previously been recorded from United States waters. The two species herein discussed were taken south of Tortugas. The genus is recognized chiefly by the double band of teeth on each side of the palate, and by the even length of the ventral rays, the inner and outer ones being nearly equal. Many of the teeth in the jaws are exposed when the mouth is closed.

S. F. H.

Saurida brasiliensis Norman

Saurida brasiliensis Norman, Proc. Zool. Soc. London, 1935, p. 125, fig. 14—Cape Frio, Brazil, 40 fathoms.

This small species, unreported before north of Trinidad, is common south of Tortugas at depths of 10 to 50 fathoms. It is sexually mature in late August at a length of 80 mm. In a series of 17 specimens none was more than 115 mm. long.

The following data are in accord with Norman's description: Total length 92 mm.; standard length 70 mm.; depth 10 mm. (7.0); head 17 mm. (4.1). Eye and snout each 4 mm. (4.2 in head); interorbital width 3 mm. (3.7). D. 10½; A. 11½; dorsal origin farther from end of snout than from tip of adipose fin; anal origin equally distant from lower base of caudal and anterior base of pectoral; pectoral fin reaching 14th scale in lateral line and beyond dorsal origin; ventrals long, extending more than halfway to anal origin; scales 3-47-5, 3 rows between adipose fin and lateral line; 17 scales in median series before dorsal origin; teeth on tongue and basipharyngeals in a single series.

Color rather pale, faintly barred across back, the most conspicuous of the slight dark saddles being at dorsal origin and at end of dorsal base.

W. H. L.

The Tortugas collection contains 11 specimens, ranging in length from 75 to 115 mm. The following proportions are based on 5 specimens, ranging in standard length from 67 to 91 mm.; the fin-ray and scale counts on 8 specimens and the vertebra count on 1 specimen dissected to expose the spinal column. Head

4.2 to 5.0; depth 6.5 to 7.5. Eye in head 4.1 to 4.8; snout 4.5 to 5.25; interorbital (bone) 7.0 to 9.0; maxillary 1.3 to 1.5; caudal peduncle 3.5 to 4.2; pectoral 4.8 to 6.0. D. 10; A. 10 or 11 (last double ray in each fin having been counted as one); P. 11 or 12; V. 9; scales 40 to 48, 3 complete rows between lateral line and origin of dorsal; vertebrae 26 + 18.

Color of preserved specimens almost plain brown above and somewhat silvery below, with the faint bars mentioned by Dr. Longley (in fresh material) obscurely visible in only a few specimens.

This species appears to differ from related ones in the small number of pectoral rays, and the rather large scales.

Florida Keys to Brazil.

S. F. H.

Saurida normani Longley

Saurida normani Longley, Carnegie Inst. Wash. Year Book No. 34, 1935, p. 86—Tortugas, Florida, 60 to 100 fathoms. Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 228, fig. 2.

Family SUDIDAE

Sudis coregonoides (Risso)

Two specimens, about 65 mm. (damaged) and 180 mm. long, are included in the Tortugas collection. Both were taken south of Tortugas, the smaller one in 295 to 315 fathoms, and the larger in 392 to 430 fathoms. These specimens seem to be *Sudis coregonoides*, a species apparently not recorded from our south Atlantic states. This species generally has been placed in the genus *Paralepis*, but we follow Parr (Bull. Bingham Oceanog. Coll., vol. 3, art. 3, 1928, p. 40) in considering *Paralepis* a synonym of *Sudis*.

The following data are based on the larger specimen, the condition of the smaller one being such that it is of little value: Body elongate, somewhat compressed; head 4.5; depth 14. Eye in head 5.4; snout long, moderately pointed, 1.9; mouth large, nearly horizontal; jaws of about equal length; maxillary 2.1 in head. Dorsal over ventrals, with 10 rays; adipose large, over posterior part of anal; anal rather long, with 31 rays; pectorals inserted low, just behind opercle, with 14 rays; ventrals inserted nearly equidistant from base of pectoral and base of caudal, with 8 rays. Teeth in the lower jaw large as in a barracuda, base of each large tooth anteriorly with a smaller one; premaxillaries with small close-set teeth; palatines each with a row of large teeth similar to those in lower jaw.

Further study of specimens from various localities seems necessary to determine definitely whether Parr, whom we follow, is correct in referring several previously recognized species to synonymy. If he is correct, much variation in the number of anal rays, for example, must exist (assuming that the numbers published are correct), as the counts coming to my notice vary from 23 to 32. Also, if illustrations and descriptions are correct there must be much variation in the thickness of the snout and the relative length of the jaws.

Deep water on both sides of the Atlantic.

S. F. H.

***Bathypterois quadrifilis* Günther**

Four specimens, 2 in fair condition, except for broken and frayed fins, are included in the Tortugas collection. Two were taken south of Tortugas in 250 fathoms, and the other 2 are without locality labels. They are respectively 50, 55, 70, and 70 mm. long to the base of the caudal.

The following enumerations and proportions are based on the specimens listed: D. 12 or 13; A. 9 or 10; P. 12, 3 uppermost rays more or less separated from the others, 2 uppermost ones greatly produced, reaching base of caudal; V. 8, outer ray somewhat produced, reaching middle of base of anal, dilated at tip; scales 48 to 56; gill rakers about 20. Head 4.6; depth about 8.5 to 10. Eye very small, about 15 in head; snout 2.9 to 3.5; maxillary reaching far beyond eye, 1.7 to 1.8.

Origin of anal well behind base of dorsal, and origin of dorsal nearer tip of snout than base of caudal by about two-thirds length of head. Lower jaw projects strongly and is curved upward at tip.

General color of preserved specimens pale gray; each scale with a jet-black spot, making crosshatching stand out prominently; base of caudal black, fins otherwise largely pale.

I find no notes on this species among Dr. Longley's field data.

Deep water from United States to Brazil.

S. F. H.

***Bathypterois viridensis* (Roule)**

Two specimens, 75 and 144 mm. long to base of caudal, both without locality data, are in the Tortugas collection. These specimens agree in nearly every respect, except color, with Parr's description and figure (Bull. Bingham Oceanog. Coll., vol. 3, art 3, 1928, p. 27, fig. 2). The following proportions and enumerations are based on the Tortugas specimens: Head 3.6; depth 5.75 to 6.8. Eye small, about 16 in head; snout 3.3 to 3.5; maxillary 1.55. D. 12 to 14; A. 11 or 12; P. in two parts, 9 + 5, the 2 uppermost rays rudimentary, the next 2 somewhat produced, reaching opposite base of dorsal; V. 7, with 1 (Parr says 2 inseparable rays) greatly produced ray, reaching nearly or quite to end of middle caudal rays; caudal forked, 2 lowermost rays produced, about 1.5 times as long as head; scales about 53; gill rakers 26 or 27.

Origin of anal in larger specimen scarcely in advance of end of base of dorsal; in smaller specimen, nearly under middle of dorsal.

General color of larger specimen very pale; head largely black; a broad black bar just behind base of dorsal and another at base of caudal. The smaller specimen is rather darker in color, and the black head and bars are less distinct.

Deep water on both sides of the Atlantic.

S. F. H.

***Chlorophthalmus chalybeius* (Goode)**

Common south of Tortugas between 180 and 280 fathoms, as many as 72 specimens having been taken in a single haul.

Eleven specimens, 47 to 130 mm. long to base of caudal, are included in the

Longley collection. Three, 47, 49, and 130 mm. long, were measured and their fin rays counted, giving the results that follow: Head (to margin of opercle) 3.4 to 3.5; depth 6.5 to 7.0. Eye in head 2.7 to 3.0; snout 3.7 to 4.3; interorbital 11 to 14; maxillary 2.2 to 2.4; caudal peduncle 4.1 to 4.8; longest rays of pectoral 1.3 to 1.4. D. 11; A. 8; P. 15 or 16; V. 8 or 9; scales in lateral line about 52. The smaller specimens are barred and blotched above with dark gray, whereas the largest specimen is almost plain. The vent in each specimen is conspicuously surrounded with black.

These specimens differ somewhat from the type in the position of the ventral fins, which are inserted well in advance of the middle of the base of the dorsal instead of under the middle, and in that of the adipose, which is situated over the anterior half of the anal instead of over the middle of it. Small differences also are evident in the proportions and counts given. All these differences, however, may constitute variations within the species. I follow Regan (Ann. and Mag. Nat. Hist., ser. 8, vol. 7, 1911, p. 126) in placing this genus and species in the family Sudidae.

In rather deep water of the Gulf Stream.

S. F. H.

***Chlorophthalmus truculentus* Goode and Bean**

Eighteen specimens, 180 to 237 mm. long, were taken July 31, 1930, in one haul in 180 to 220 fathoms. Both males and females were in breeding condition. The fish were dusky dorsally and pale ventrally, having no pattern; caudal dusky; dorsal dusky at tip. In another haul 9 were taken in 220 to 237 fathoms. Eight specimens, 180 to 200 mm. long, were taken in still another haul in 205 to 221 fathoms.

This species is distinguished from the preceding one by the more produced, sharper snout; smaller mouth, with maxillary failing to reach front of eye; scales cycloid instead of pectinate; shorter dorsal with only 9 rays; and plainer color.

Four specimens are deposited in the U. S. National Museum, ranging in length from 152 to 163 mm. In 3 of these the dorsal consists of 10 rays, and in 1 of 9; in 3 the anal has 9 rays, and in 1 it has 10.

Previously recorded from Barbados. The range is now extended to Florida.

S. F. H.

Family MYCTOPHIDAE. LANTERN FISHES

***Neoscopelus macrolepidotus* Johnson**

A specimen of this deep-sea fish was taken at a depth of 367 to 375 fathoms. Concerning the color of this specimen Dr. Longley wrote: "In posterior angle of each luminous organ a red spot. Bases of pectoral reddish. Red chromatophores sparsely scattered on all the fins, and on head."

Five specimens of this species, respectively 73, 80, 80, 98, and 135 mm. long to base of caudal, are included in the Tortugas collection, all without specific data. The specimens all have broken and frayed fins. The following enumerations and proportions are based on the two best specimens: Head 2.8 to 3.05; depth 4.1 to

4.6. Eye in head 4.0 to 4.7; snout 4.1 to 4.5; interorbital 5.2 to 6.0; maxillary 1.75 to 1.9; caudal peduncle 3.8 to 3.9. D. 13; A. 13; P. 17; V. 8 or 9. The abdominal ventrals are inserted under the origin of the dorsal, and the maxillary almost reaches the posterior margin of the eye. The luminescent organs are confined to the ventral surface of the body.

This species is reported from all temperate and warm seas.

S. F. H.

Family BELONIDAE. HOUNDFISHES; NEEDLEFISHES

Strongylura Van Hasselt, 1824

As *Strongylura* has priority over *Tylosurus*, long used for most of the American houndfishes, the former properly replaces the latter. I see no sound reason for separating into two genera the species formerly included in *Tylosurus*, as in Jordan, Evermann, and Clark (Check list, 1930, p. 195). Accordingly the Tortugas species herein are all listed under *Strongylura*.

S. F. H.

Strongylura notata (Poey)

Young up to 175 mm. in length were taken commonly with *Hepsetia stipes*, west of Loggerhead Key and in brackish pools on Long Key.

D. 13 or 14; A. 13 or 14. Distinguishable from other Tortugas species by stout body and absence of caudal keels. Color pale greenish. Faint trace of reddish color on tips of vertical fins. The eye is below the upper margin of the silver on the side and is like tinsel in appearance except for a dusky area just above the pupil.

W. H. L.

Breder (Carnegie Inst. Wash. Pub. 435, 1932, p. 3) listed this species from Tortugas and referred to it as "a shore-loving form."

Florida to West Indies.

S. F. H.

Strongylura longleyi Breder

Strongylura longleyi Breder, Carnegie Inst. Wash. Pub. 435, 1932, p. 12, text fig. 5, B; pl. 2, fig. 1; pl. 3, fig. 5; pl. 9—Tortugas, Florida.

No mention of this species was found among Dr. Longley's notes. The following enumerations and proportions are given in the original description, based on the type, which had a length of 320 mm., standard length 300 mm.: Head 2.9. Depth in postorbital part of head 1.6; eye 1.8; width of head 1.3; interorbital 2.0; width of body 1.4; pectoral 0.9; ventral 1.6; lower caudal lobe 0.8. Snout in head 1.4; dorsal base 3.4; anal base 2.8. D. 13; A. 18; scales about 160, before dorsal about 130. The head was described as broad and flat above, its depth being contained in its width 1.1 times.

The type was greenish above, silvery below, with an indistinct lateral stripe; keel of peduncle bluish black; fins slightly dusky; opercle with a suggestion of a dark bar.

Breder also had 10 paratypes, 71 to 305 mm. long, and 2 young, 34 and 39 mm. long, questionably referred to this species. The fish apparently is distinguished

chiefly by its long, low, broad head, depressed peduncle with a broad, dark keel, and short dorsal and anal. Its nearest relative according to Breder is *ardeola*, which apparently is *timucu* as identified by Longley.

Breder discussed and illustrated in part the development of the young.

Known only from Tortugas, Florida.

S. F. H.

***Strongylura timucu* (Walbaum)**

Common at Tortugas, as many as 63, 225 to 350 mm. long, having been taken at one time.

Dr. Longley's notes, which are embodied in this account, are all under *Tylosurus marinus*. In his copy of Jordan, Evermann, and Clark's *Check list*, however, he indicated that he had come to the conclusion that the specimens he had earlier identified as *marinus* were *timucu*. Two specimens available for examination certainly are not *Strongylura marina*. On the basis of these data *marina* apparently does not occur at Tortugas. It seems significant that *marina* was not listed (field notes) from Key West during several years' intermittent collecting by Bureau of Fisheries investigators, whereas *timucu* seemingly was rather common.

The 2 specimens from Tortugas examined by me have 14 and 15 rays in the dorsal and 14 and 16 in the anal, and the scales on the single specimen retaining them number about 255 in the lateral series, 24 series under base of dorsal, and 42 from origin of anal to base of caudal. In each specimen scales plainly are present on cheeks and opercles. Dr. Longley has the following fin-ray counts, based on 4 specimens: D. 12, 13, 13, and 14; A. 14, 15, 18, and 18.

Strongylura timucu, according to the two specimens at hand, differs from *S. marina* principally in having larger scales (*marina* having about 325 in a lateral series, 38 under base of dorsal, and 66 from origin of anal to base of caudal), which are present on both cheek and opercle (missing on opercle in *marina*). Furthermore, the ventral fins apparently are inserted farther back, being more than twice as far from base of pectorals as from origin of anal, whereas in *marina* they generally are exactly twice as far from base of pectorals as from origin of anal.

Dr. Longley stated: "This is by far the slightest of the three Tortugas species recognized. The dermal keels on the sides of the caudal peduncle render the body, of the young at least, of more nearly uniform width throughout their length than the others. There is no marked inequality in the development of the lobes of the caudal as in *raphidoma*." In another entry he said that these two species may be distinguished readily in the water by the difference in the shape of the body and tail. Furthermore, *timucu* has a longer and thinner bill, and no spots on the sides, which sometimes are present in *raphidoma*.

According to Breder (Carnegie Inst. Wash. Pub. 435, 1932, p. 7), the specimens from Tortugas, examined by me, probably are *S. ardeola*. As understood by Breder, *timucu*, which he also listed from Tortugas, has a longer dorsal fin (17 rays) and a lower, wider head, the width exceeding the depth, whereas in *ardeola* the depth exceeds the width. Breder stated also that the specimens listed

as *Tylosurus marinus* by Gudger (Carnegie Inst. Wash. Pub. 391, 1929, p. 157) were either *timucu* or *longleyi*.

Florida Keys and southward, probably to Brazil.

S. F. H.

***Strongylura raphidoma* (Ranzani). HOUND FISH**

This species is referred to in Dr. Longley's notes as one of the two common ones (the other being *marina* = *timucu*) seen around the Laboratory dock. As many as 34 young ones were taken at one time.

Fin-ray counts appearing in the notes, based on at least 8 specimens, are: D. 21 to 24; A. 19 to 22. Two specimens from Tortugas at hand have D. 21 and 22; A. 20 and 21. Dorsal fin posteriorly much higher in young than in adult, overlapping caudal in small fish. Dorsal and anal opposite each other; lower lobe of caudal notably longer than upper. Scales very small, about 350 in a lateral series.

The color of a dead specimen is described as greenish above, silvery on side; pectoral greenish; anal and ventrals with little or no pigment. Other fish, as seen in the water, were greenish above, with silvery sides. The young, about 125 mm. in length, have fifteen to eighteen brown blotches on the side, which are distinct from each other when such fish are placed in a white dish, but confluent in a lateral dark stripe in a black dish.

Dr. Longley made the following interesting note: "At the dock I noticed *raphidoma* giving an exhibition of its interesting play. Five or six specimens were jumping over a piece of floating paper. Sometimes one would go back and forth quickly as many as three times. Sometimes one would put its snout slowly above the paper and then quickly glide across it; more usually they would make a clear leap. One caught its beak in water after leaping and turned somersault (apparently accidentally). This morning fish were jumping across a floating feather, and two larger fish were jumping across the floating body of a fish of their own species."

A female, 446 mm. long, in spawning condition, was taken from the stomach of a shark on July 5, 1929.

This species grows large. I have a record (field notes) of one 125 cm. long from Beaufort, North Carolina.

From the middle Atlantic states southward probably to Brazil.

S. F. H.

***Strongylura acus* (Lacépède)**

No mention of this species was found in Dr. Longley's notes. Breder (Carnegie Inst. Wash. Pub. 435, 1932, p. 14) stated in part, "Mature specimens of this species are to be found at the Tortugas in early July as small as 650 mm. in standard length." The development of the beak and tail is illustrated, and the color of the young up to about 30 mm. in length is described by Breder.

West Indies and occasionally northward.

S. F. H.

***Ablennes hians* (Cuvier and Valenciennes)**

Only the following was found in Dr. Longley's notes: "Took *Athlennes hians* in night fishing south of Tortugas." There are no specimens in the collection.

This species, which is the only one in its genus, is readily recognized by the

compressed body, its sides being nearly vertical. The dorsal has about 24 rays, and the anal 25.

North Carolina, probably to Brazil; also reported from the Pacific. S. F. H.

Family HEMIRAMPHIDAE. HALFBEAKS

Hemiramphus brasiliensis (Linnaeus)

One of the predominantly green and silver surface fishes of open water, often swimming in small schools. It may be identified at a distance by the reddish upper caudal lobe. Not rare among scraps from the tern rookery, where a packet of 2 and one of 3 were found all similarly oriented, closely adhering, and lying as they were dropped by birds feeding their young, reflecting the fish's gregarious habit.

All fresh specimens were taken at the surface, about a submerged light at night, in the local 10-fathom channels and in 8 to 12 fathoms west or south of Loggerhead Key.

Florida to Brazil.

W. H. L.

Hyporhamphus unifasciatus (Ranzani)

This species apparently is not mentioned in Dr. Longley's notes. His collection contains a juvenile, however, 39 mm. long from tip of upper jaw to base of caudal. Because of its immaturity and faded condition the specific identification is somewhat uncertain. Those characters that can be checked are correct for this species. The dorsal, which begins slightly in advance of the anal, has 16 rays, the anal 15. These counts are rather too high for *Hemiramphus brasiliensis*, which has 13 rays in the dorsal and only 11 in the anal in the single specimen in the Tortugas collection. This juvenile, though greatly faded, has four dark bars on the side, the first being under the tip of the pectoral and the last at the origin of the anal. The bars are regarded as juvenile characters, which the adult does not possess.

Breder (Carnegie Inst. Wash. Pub. 435, 1932, p. 20) stated, "A species nearly as common as the preceding [*Hemiramphus brasiliensis*], along the Florida Keys."

Both coasts of America, on the Atlantic from about Rhode Island to Brazil.

S. F. H.

Euleptorhamphus velox Poey

Seen occasionally to spring up beneath a boat's bow and skitter over the water on its side with head elevated, body flexed, and tail fluttering. It is not uncommon about Tortugas, as 40 or more have been noticed in waste from the tern rookeries.

In 12 specimens examined, the dorsal had twice 21, four times 22, and six times 23 rays; the anal, similarly, had once 20, six times 22, and twice 23 rays. The type examined in the Museum of Comparative Zoölogy (no. 8779) had 22 rays in the dorsal and the same number in the anal.

West Indies and northward in the Gulf Stream.

W. H. L.

Family EXOCOETIDAE. FLYING FISHES

A fairly full account, with key, of the flying fishes, based on a study made principally at Tortugas, is given by C. M. Breder (Carnegie Inst. Wash. Pub. 435, 1932, p. 24) for each of the three species known from that vicinity. Breder's nomenclature has been followed. S. F. H.

***Parexocoetus mesogaster* (Bloch)¹**

The commonest of Tortugas flying fishes, and the most abundantly represented fish in the waste, and presumably in the food, of the Bird Key tern colony. Information concerning its habits and development may be found in Breder's paper to which reference is made above. W. H. L.

Dr. Longley did not find the opportunity to prepare a color description which he evidently intended to add, as shown by a marginal note. Only the following appears among his field data: "Dorsal surface to line of level of lower pectoral base indigo blue. Iris, cheek, pectoral base, sides, and belly gleaming silver. Pectorals transparent with only a suggestion of blue."

Caribbean Sea, sometimes straying northward and southward. S. F. H.

***Halocypselus evolans* (Linnaeus)²**

Dr. Longley mentions in his field notes "a single specimen found by C. M. Breder among several thousand of the common flying fishes (*Parexocoetus mesogaster* and *Cypselurus furcatus*) from Bird Key, where they had been dropped by terns breeding there."

Breder (Carnegie Inst. Wash. Pub. 435, 1932, p. 22) stated that this species was seen in flight occasionally between Key West and Tortugas, Florida, and continued: "The only specimens from the latter locality were found as fragments left by the terns of Bird Key."

This flying fish seems to be allied to *Parexocoetus mesogaster*, at least in that the ventral fins are not greatly enlarged, as in *Cypselurus furcatus*. It differs from the former notably in having longer pectorals, which reach beyond the end of the dorsal base. It differs from both in having the ventrals inserted nearer the tip of the snout than the base of the caudal. A color plate is included in a publication by Nichols and Breder (Zoologica, vol. 8, no. 7, 1928, p. 427, fig. 172).

Caribbean Sea, sometimes straying northward and southward. S. F. H.

***Cypselurus furcatus* (Mitchill)**

The young were found rather commonly within the lagoon singly or in schools among the drifting *Sargassum* and *Cymodocea*. Fragments of this species were abundant also in the waste of the Bird Key tern colony.

¹ Recently it has been found that *mesogaster* is not available for any *Parexocoetus*. It accordingly becomes *P. brachypterus* Richardson (see Breder, Bull. Bingham Oceanog. Coll., vol. 6, art. 5, 1938, pp. 16-28).—S. F. H.

² Anton Bruun ("Flying Fishes [Exocoetidae] of the Atlantic," Dana Rept. No. 6, 1935, p. 28) referred this species to *Exocoetus volitans* Linnaeus, a procedure followed by Breder (Bull. Bingham Oceanog. Coll., vol. 6, art. 5, 1938, p. 30).—S. F. H.

The habits and development of the species are discussed by C. M. Breder (Carnegie Inst. Wash. Pub. 435, 1932, p. 22). At something less than half adult length, when the pattern is sharpest, three bands are carried across both body and ventral fins. The sections of the bands on body and fins correspond perfectly, although there is no direct physical continuity between the body and fins, except in the first one. This is another example of the general truth that the pattern is spread upon the bodies of fishes as a whole, without reference to the relations of underlying structures.

W. H. L.

Color plates of a young and an adult are shown by Nichols and Breder (Nat. Hist., vol. 28, no. 1, 1928, pp. 64-77; Zoologica, vol. 8, no. 7, 1928, pp. 423-448). Caribbean Sea, Gulf of Mexico, sometimes straying northward. S. F. H.

Family MACROURIDAE. RATTAILS

Bathygadus favosus Goode and Bean

A single specimen, about 215 mm. (caudal damaged) long, is contained in the Tortugas collection. Although there are no data with the specimen, a "*Macrourus*" is listed in Dr. Longley's field notes, taken in 200 to 253 fathoms, south of Tortugas, described as having "a large mouth" and being "at least 9 inches long," which seems to be the one in hand.

This imperfect specimen agrees fairly well with 2 paratypes from the Gulf of Mexico, except that the eye in the Tortugas example seems to be larger, agreeing in that respect with *Bathygadus vaillanti* Roule and Angel (Resul. camp. sci., Poiss., vol. 86, 1933, p. 63, pl. 3, fig. 30). The pectoral fin obviously is longer than is indicated in Goode and Bean's figure (Ocean. Ichthyol., 1895, p. 420, fig. 352), wherein, however, it agrees with one of the paratypes of *B. favosus*, which has an apparently unbroken fin.

The following proportions and enumerations are based on the Tortugas specimen: Head in total length about 5.0; depth 7.0. Eye in head 3.6; snout damaged, about 3.6. First D. 11; P. 12; V. 8; gill rakers on lower limb of first arch, 20.

Deep water off Martinique; now reported for the first time from Florida.

S. F. H.

Chalinura occidentalis (Goode and Bean)

This macrourid is listed as the "common sort" by Dr. Longley, as many as 20 on one occasion and 15 on another having been taken in one haul, in 140 to 283 fathoms.

The body is moderately deep and compressed, and differs from most other species of the family in the Tortugas collection in the position of the vent, which is close behind the base of the ventral fins, much nearer to this point than to the origin of the anal. The ventrals are inserted well in advance of the pectorals, and thus somewhat in advance of the opercular margin. Goode and Bean's statement (Proc. U. S. Nat. Mus., vol. 8, 1885, p. 597) that the ventrals are inserted under the middle of the first dorsal, which is where the anal begins, was probably a slip of the pen.

First D. 14, 2 specimens counted (Goode and Bean gave only 11); P. 17; V. 8. Gill rakers very short and thick, and beset with spinules, 7 on lower limb of first arch. Head in total length 6.0; depth 7.2 to 7.8; distance from snout to origin of first dorsal 5.1 to 5.3. Eye in head 3.3 to 3.5; snout 3.7 to 4.1; interorbital 4.1 to 4.5; pectoral 1.8.

General color brownish; abdomen and branchiostegal membranes dusky to black; distal part of first dorsal and axil of pectoral dusky.

In deep water off the south Atlantic states and in the Caribbean Sea.

S. F. H.

Macrourus holotrachys Günther

Five specimens, ranging in length from 170 to 190 mm., are in the Tortugas collection. Though without definite data, the specimens quite certainly were taken in the deep channel south of Tortugas at a depth somewhere between 140 and 393 fathoms.

This material seems to fit Günther's description and figures (Ann. and Mag. Nat. Hist., ser. 5, vol. 2, 1878, p. 24) fairly well, though the species apparently has not been recorded off the North American coast. This species is characterized chiefly by the high number of ventral rays (9), and by 3 spiny prominences on the margin of the snout, a large central one and a smaller one on each side. The vent is near the base of the ventrals, being much nearer to these fins than to the origin of the anal.

A few discrepancies between Günther's description and the specimens at hand are evident. Günther stated that the snout was as long as the eye, whereas in the Tortugas material it is shorter than the eye. He also stated that the origin of the second dorsal was behind the first dorsal scarcely the length of the base of the first. I am unable to find any rays or stumps of rays nearer than about twice the length of the base of the first dorsal in the somewhat damaged specimens at hand.

The following proportions and enumerations are based on the 4 specimens in the collection: Head in total length 5.75 to 6.25; depth 7.0 to 8.0. Eye in head 2.5 to 3.1; snout 3.4 to 3.7, its projection beyond tip of lower jaw 3.5 to 3.8; interorbital 4.6 to 5.2. D. about 124 to 150; A. about 100; P. 19 to 21; V. 9.

Color mostly brownish; abdomen, opercle, and lower parts of head dusky; orbit margined with a black line; anterior rays of first dorsal distally black.

Deep water off the mouth of the Rio Plata, now for the first time from Florida.

S. F. H.

Coelorhynchus carminatus (Goode)

This species is listed as the "rough rattail" by Dr. Longley. It apparently is as common as *Chalinura occidentalis*, with which it often was taken. Many specimens were caught in 180 to 393 fathoms.

It is recognized by the extremely rough scales, the free parts of which are covered with sharp spines; margin of snout and ridges of the head also rough, with spinules; snout depressed, projecting nearly its full length beyond mouth, flat or even slightly concave underneath; 2d dorsal spine perfectly smooth; 2d ray

(spine) of first dorsal fully as long as 3d and 4th, its length equal to eye and snout; ventral filament, attached to outer ray of fin, reaching a little beyond origin of anal.

General color gray; first dorsal crossed by a black bar at about mid-length; black saddle on back, under and behind tips of rays of dorsal, the latter missing in the largest specimen (235 mm.); axil of pectoral black; inside of gill covers dusky; peritoneum black.

The following proportions and enumerations are based on 2 specimens, 175 and 235 mm. long: Head in total length 4.1 to 4.6; depth 4.9 to 6.5. Eye in head 3.1 to 3.5; snout 3.0 to 3.9, its projection beyond lower jaw 3.5 to 3.8; interorbital 4.65; pectoral 1.9; ventral 2.8 to 3.2. D. 10-73 to 76; A. 85 to 90; P. 17; V. 7. The rays in the second dorsal and in the anal become so short and indefinite posteriorly that the counts given should not be considered accurate.

Gulf Stream, south to the Caribbean Sea.

S. F. H.

Hymenocephalus sp.

A single damaged specimen, about 200 mm. long, and fragments of two others belonging to the genus *Hymenocephalus* are in the collection. One of these specimens was taken in 357 to 392 fathoms and the others in 430 fathoms. I am unable to identify this material with any known species. Because of the unsatisfactory condition of the specimens it does not seem advisable to attempt to found a new species on them. The specimens apparently are nearest to *H. cavernosus*, paratypes of which were compared with the Tortugas material. The caudal part of the body seems to be more robust in the Tortugas specimen; the 2d dorsal spine, though broken, seems to be longer; and the ventral rays are more numerous (13, whereas *H. cavernosus* has 11). The skull is equally cavernous; the teeth in both jaws are in bands, the outer ones in the upper jaw being somewhat enlarged; and the position of the fins and the color apparently are identical.

The following proportions and enumerations, exclusive of that of the ventral, are based on the single specimen in good enough condition to be measured. Even this specimen is in three pieces, with ventrals missing, and the second dorsal and anal so broken and mutilated that an enumeration of the rays is impossible: Head in total length 6.2; depth 6.6. Eye in head 2.7; snout 4.5; interorbital 4.6; pectoral 1.45. Distance from tip of snout to origin of first dorsal in total length 4.9; distance from tip of snout to origin of anal 3.35. First D. 12; P. 13 to 15; V. 13.

Concerning one of these specimens Dr. Longley wrote: "Mouth undershot; first dorsal spine smooth; body iridescent." The large mouth is nearly horizontal; the maxillary reaches about opposite the posterior margin of the pupil; and the free part of the scales is covered with spines.

S. F. H.

Family BREGMACEROTIDAE

Bregmaceros atlanticus Goode and Bean

The collection contains 6 specimens, 42 to 58 mm. long, all from south of Bird Key, from muddy bottom: 4 from 20 fathoms, 1 from 30, and 1 from 40 fathoms.

Concerning these specimens Dr. Longley wrote: "The species has an adipose eyelid, and it has a ventral groove, extending back from the ventral fins to the anal, into which the ventral fins fold with their tips continuing beyond the origin of the anal in grooves on either side of the fin. Their silvery lateral stripes with slight pigmentation over dorsal side suggest a pelagic habit. But the great (long, narrow, feeler-like) ventrals, and the fact that these fish are caught in dredges, seem to indicate life on the bottom."

Dr. Longley described another specimen, 62 mm. long, as having the teeth in lower jaw biserial, inner ones enlarged; those in upper jaw also biserial, but outer ones enlarged; all depressible, close-set canines. The species is recognized by its hairlike ray at occiput, and by the long dorsal and anal (D. $46\pm$; A. $43\pm$), with anterior lobes of each higher, and both in a scaly groove. Caudal emarginate; scales large, cycloid. Slight pigmentation above, and a suggestion of a silvery lateral stripe.

The following proportions and enumerations are based on 3 specimens, respectively 43, 56, and 58 mm. long: Head 6.0, 5.9, 6.0; depth 6.3, 5.9, 6.0; dorsal filament 4.5, 4.9, 4.5; ventral filament 2.1, 1.9, 2.0. Eye in head 3.0, 3.4, 3.3; snout 6.0, 5.2, 5.2; interorbital 6.0, 4.9, 5.5; pectoral 1.4, 1.4, 1.25. D. 1-46, 1-49, 1-47; A. 47, 47, 46; P. 16, 14, 15; V. 1, 5 (1st or outer ray entirely separate from the others); scales 64, 64, 65. The dorsal and anal fins, though with short rays following the moderately high anterior lobes, are continuous, in agreement with Goode and Bean's figure (Ocean. Ichthyol., 1895, p. 388, fig. 331), and not divided as seems to be indicated in their description, an error apparently copied by other writers.

West Indies; now recorded from Florida for the first time.

S. F. H.

Family GADIDAE. CODFISHES, HAKES, ETC.

Gadella maraldi (Risso)

Dr. Longley listed 13 specimens of this species, taken in 180 to 283 fathoms, of which 5, ranging in length from 95 to 170 mm., are at hand. He questioned the identity of the American specimens with the European ones. The fish agree fairly well with the descriptions of European material, except that the head and body seem to be more compressed, though proportionately not deeper. To settle the question, direct comparison of European and American specimens, which is not possible at this time, apparently would be necessary.

This species was recorded from the island of Nevis in the West Indies by Goode and Bean (Ocean. Ichthyol., 1895, p. 367), from a single poor specimen which apparently is the only one of the species reported from American waters. It supposedly was deposited in the U. S. National Museum, but cannot be found at this time. Goode and Bean's figure 320 seems to represent another species, as the body is shown much too deep for *maraldi*, the dorsal fin as continuous instead of divided, and the ventral fins much too short and without filaments.

Head and body considerably deeper than broad; mouth large, oblique, with lower jaw included but scarcely shorter than upper; maxillary reaching about opposite posterior margin of pupil; teeth moderately large and pointed, in a

single irregular series anteriorly in upper jaw, and in two indefinite series posteriorly; lower jaw with indication of more than one series anteriorly, but only one posteriorly; origin of first dorsal over or a little behind vertical from base of pectoral; the two dorsals scarcely separated, last rays of first fin notably shorter than first rays of second fin; dorsal and anal well separated from the round caudal; anal fin similar to dorsal, though not quite as high, its origin being only about an eye's diameter behind origin of first dorsal; pectoral fins inserted somewhat below middle of side, rather long and pointed, the longest rays being equal to or in some specimens somewhat longer than head without snout; ventrals inserted about under posterior margin of preopercle, 2d ray longest, filamentous, reaching somewhat beyond origin of anal.

The color of fresh specimens is described by Dr. Longley as bluish above and blue-black below. In preserved material the chest, the abdomen, and a stripe on each side of the anterior two-thirds of the anal are black; the rest of the fish brownish; tongue and roof of mouth each with a characteristic anchor-shaped black mark; anchor on tongue covering tip, with stalk directed backward; the one on roof of mouth involving vomer, with stalk of anchor running backward on median line; peritoneum black.

The following proportions and enumerations are based on 3 specimens, respectively 115, 155, and 170 mm. long: Head 4.2, 4.3, 4.5; depth 6.0, 5.5, 5.9. Eye in head 4.0, 3.75, 3.8; snout 4.5, 4.2, 4.25; interorbital 5.0, 4.6, 4.7; maxillary 1.9, 2.0, 1.9; pectoral 1.4, 1.2, 1.3; ventral ?, 1.9, 1.8. D. 55, 60, 55; A. 54, 60, 55; P. 25, 23, 22; V. 5, 5, 5.

Southern Europe, West Indies, and Florida, if European and American fish are identical. S. F. H.

Laemonema Günther, 1862

This genus differs from *Phycis* and *Urophycis*, to which it is closely related, in the short first dorsal, which is composed of only 5 or 6 rays. Contrary to the description of the genus, the narrow filamentous ventrals, at least in *Laemonema barbatulum*, are composed of 2 closely joined rays, instead of 1. S. F. H.

Laemonema barbatulum Goode and Bean

Apparently rather common in deep water south of Tortugas, as Dr. Longley listed 89 specimens, 130 to 275 mm. long, taken in 98 to 315 fathoms.

Dr. Longley described the color of a fresh specimen as gray, and only slightly darker above than below; a faint dark line on side back from eye; filament of first dorsal, margin of second dorsal, posterior third of caudal, and border of anal black.

Ten specimens, 130 to 178 mm. long, are in the collection. Little variation is evident. The following proportions and enumerations are based on 3 specimens, respectively 130, 165, and 178 mm. long: Head 4.6, 4.6, 4.6; depth 5.8, 4.6, 4.6; distance from tip of snout to dorsal 4.1, 4.4, 4.0; dorsal filament 3.3, 3.25, 3.4. Eye in head 3.1, 3.0, 3.3; snout 3.8, 3.9, 4.1; interorbital 6.6, 6.6, 7.0; maxillary 6.6, 6.6,

7.0; pectoral 1.3, 1.3, 1.5; ventral 1.3, 1.3, 1.5. D. 5-58, 5-54, 5-58; A. 52, 53, 57; P. 18, 18, 19; V. 2, 2, 2; scales about 150; gill rakers 12, 14, 13.

Gulf Stream.

S. F. H.

Phycis Röse, 1793

Dr. Longley used the generic names *Phycis* and *Urophycis* in his notes, presumably following the *Check list* by Jordan, Evermann, and Clark (1930). I am letting Dr. Longley's nomenclature stand, though I do not think that splitting the older genus, *Phycis*, is justifiable, as already stated by Hildebrand and Cable (Bull. U. S. Bur. Fish., vol. 48, no. 24, 1938, p. 612, footnote). For notes on the development and structure of the ventral fins see the paper just cited.

S. F. H.

Phycis cirratus Goode and Bean

Dr. Longley listed 14 specimens, varying in length from 150 to 350 mm., taken south of Tortugas in 60 to 197 fathoms. He has the following note: "In color in all respects conforming to description of Goode and Bean (Ocean. Ichthyol., 1895, p. 358), except that the dusky stripe on snout (homologous with lower stripe in *regius*) is a little more pronounced. Peritoneum black."

Two specimens from Tortugas are at hand. They seemingly agree almost perfectly with the type, with which they have been compared. The rather long, low first dorsal, which is scarcely higher than the second dorsal and bears no filament; the low anal, only about half as high as the dorsal; the narrow pectorals, which fail to reach the origin of the anal by more than an eye's diameter; and the small number of gill rakers are useful in distinguishing this species from related ones.

The following proportions and enumerations are based on 2 specimens, 150 and 275 mm. long: Head 4.2, 3.9; depth 5.8, 4.9; ventral filament 2.25, 2.6. Eye in head 4.1, 4.8; snout 5.8, 4.5; interorbital (bone) 8.0, 7.9; pectoral 1.3, 1.6. D. 10-66, 11-60; A. 60, 51; P. 15, 14; scales lost, about 90 pockets; gill rakers 11, 10.

Deep water of Gulf of Mexico.

S. F. H.

Urophycis regius (Walbaum)

Dr. Longley listed 19 specimens, 168 to 350 mm. long, taken in 60 to 283 fathoms. No examples of this common northern form were found in the collection.

It is recognized by the low and rather short first dorsal, which has no filament, is largely black margined with white, and has 8 or 9 rays; by the moderately large scales (89 to 97 in lateral series); by the rather numerous gill rakers (13 or 14 on lower limb of first arch); by the very short chin barbel, which does not exceed in length the pupil of the eye; and by the lateral line's being situated in a black streak, which is interrupted at intervals by white spots.

This hake apparently does not occur in shallow water at Tortugas, though common along the shores in bays and estuaries from New York to North Carolina, where it also occurs in deep water. According to records at hand this

species previously was recorded no farther south than off the coast of South Carolina, at $32^{\circ} 43' 25''$ N., $77^{\circ} 20' 30''$ W., in 233 fathoms. S. F. H.

Urophycis chesteri (Goode and Bean)

Dr. Longley listed 29 specimens, 250 to 300 mm. long, taken in 135 to 315 fathoms. There is no representative of this species in his collection. The one so labeled is obviously *Phycis cirratus*, a very different species, indicating that labels became mixed.

This species is recognized by the very long filament of the 3d ray of the first dorsal, which in the type reaches to the beginning of the last fourth of the second dorsal; by the very long ventral filament, which fails to reach the end of the anal by only a little more than an eye's diameter; by the moderate number of scales (about 90) in a lateral series; and by the rather numerous gill rakers (16 on lower limb of first arch).

The occurrence of this common northern species at Tortugas is interesting, as it apparently had not previously been recorded farther south than off the coast of North Carolina, at $34^{\circ} 35' 30''$ N., $75^{\circ} 45' 30''$ W., in 32 fathoms.

S. F. H.

Family MERLUCCIIDAE. HAKES

Merluccius bilinearis (Mitchill)

This common northern fish of both shallow and deep water occurs only in deep water southward. Dr. Longley listed many specimens, ranging from 120 to 535 mm. in length, taken in 140 to 392 fathoms.

Dr. Longley was of the opinion that the Tortugas specimens might represent a southern subspecies, because of the fewer fin-rays. He listed the counts for 7 specimens, giving the following results: D. 12-37, 11-37, 12-38, 13-37, 12-39, 11-39, 11-37; A. 37, 37, 37, 36, 38, 37, 36. I counted rays in 7 specimens from Massachusetts and Rhode Island, reaching the following results: D. 12-38, 12-41, 13-39, 13-38, 12-38, 12-39, 12-39; A. 39, 40, 40, 41, 41, 40, 39. A somewhat lower count for the Tortugas fish is evident for these small samples. Many more specimens will have to be examined critically and many counts will have to be made, however, to establish the exact relationship.

The food found in the few stomachs that retained any consisted of squids and fish vertebrae.

Newfoundland to the Bahamas and Tortugas, Florida.

S. F. H.

ORDER HETEROSOMATA. FLOUNDERS; FLATFISHES

It is evident from that part of the work more or less completed by Dr. Longley that he intended to use the nomenclature of Norman, *Flatfishes (Heterosomata)*, vol. 1, 1934, at least in so far as the families and genera are concerned. This procedure has been carried out by me.

S. F. H.

Family BOTHIDAE

The flounders of this family normally have the eyes and color on the left side. It includes about 21 genera, mostly from tropical and temperate seas.

S. F. H.

***Paralichthys squamilentus* Jordan and Gilbert**

Six specimens, the largest 415 mm. long, were taken south of Tortugas in 45 to 110 fathoms. D. 75 to 79; A. 56 to 62; gill rakers on lower limb of first arch 9 or 10.

South Atlantic and Gulf coasts of United States.

W. H. L.

***Paralichthys oblongus* (Mitchill)**

Fourteen specimens of this northern species up to the length of 290 mm. were taken south of Tortugas. Only 1 specimen was taken below 220 fathoms, and one doubtfully from within the 110-fathom line.

Apparently previously recorded only from the coast of the United States, from New York northward.

W. H. L.

***Ancylosetta dilecta* (Goode and Bean)**

Six specimens 195 to 285 mm. in length were taken: 5 in 80 to 100 fathoms, and the 6th between 65 and 125 fathoms.

One specimen had D. 70; A. 55; scales in lateral line 83, with 32 of these in the arch; gill rakers 3 + 8. Color light gray, finely and freely spotted with brown; with three large ocelli the size of the eye.

Gulf Stream.

W. H. L.

***Gastropsetta frontalis* B. A. Bean**

Two specimens, 90 to 115 mm. long, were dredged in 10 fathoms west of White Shoal, and another, 145 mm. long, south of Tortugas in 50 fathoms.

D. 60 to 63; A. 49 to 50. Gill rakers short and broad, longest scarcely one-quarter long diameter of pupil, only about 4 on lower limb of first arch; scales small, embedded, cycloid, about 120 with pores in lateral line to base of caudal; anterior rays of dorsal elongate and greatly exserted, but neither "singularly branched" nor failing in their basal connection with one another by the fin membrane.

Ground color of a yellow cast, flecked with circular blue spots; somewhat smaller blue spots with dark blue centers scattered profusely on fins; three ocellated spots, two toward dorsal, one toward ventral side; the three incorporated by enclosing blue lines in a figure mothlike in outline; head crossed by narrow transverse dashes of blue, five on the eyes, of which the anterior and posterior turn toward the anterior and posterior margins of the pupils.

Florida.

W. H. L.

Syacium Ranzani, 1840

The two Tortugas species of *Syacium* apparently are not separable from a single feature, but on the basis of multiple characters they are distinguishable without difficulty.

Syacium papillosum attains the larger size, generally is more slender, shows sexual dimorphism in color not shown by *S. gunteri*, has more accessory scales than *S. gunteri* at the same size, and usually has the larger number of scales in the lateral line, and a greater number of dorsal and anal rays. Of *S. papillosum*, in a sample of 99 from Tortugas, 1 specimen has fewer than 84 dorsal rays, but of *S. gunteri*, in a sample of 31, only 1 specimen has more than 84. Approximately 50 per cent of the species first named have 86 to 88 dorsal rays, and 50 per cent of the second have 78 to 80 dorsal rays (see tables). Depth of body in standard length 2.2 to 2.4 in *S. papillosum*, and 1.8 to 2.0 in *S. gunteri*; scales in lateral line about 50 to 56 in *S. papillosum* and 44 to 51 in *S. gunteri*. W. H. L.

Syacium papillosum (Linnaeus)

Very common in 10-fathom channels, also in slightly deeper water to the east of Bush Key and Bird Key reef; abounding at the depth of 40 fathoms, south of Tortugas, extending its range to 60 fathoms.

Males (at Tortugas) are not white on the blind side but more or less cinereous, at about 150 mm. in length and upward. Half-grown males and older ones differ besides from females by having before the right eye two parallel lines of blue running toward the tip of the snout, though the one nearest the dorsal outline is blotted out anteriorly on the blind side. Much more confusing is the fact that both sexes vary greatly in appearance, as the surroundings vary from which they come. Off gray muddy bottom in 40 to 60 fathoms they are nearly plain gray, but from the more brilliantly illuminated bottom in 10 to 15 fathoms they vary in ground color from cream-buff to drab and are highly variegated. The pattern, however, is rather constant, including three dusky areas along the lateral line (the foremost just before its point of inflection, the anterior margin of the next equidistant from tips of snout and tail, the last just before base of caudal peduncle; the first nearly circular, the second and third more extended respectively in the transverse and long axes); body also with many circular pale spots with dark centers; almost a score of pale spots on median fins; body and fins also with many minute dark dots; pectoral fin crossed by three bars.

In the belief that the color of this species is "nearly plain brown, with darker dots or mottlings, no ringlike spots or ocelli," some students have assigned to *Syacium micrurum* specimens really belonging to *S. papillosum*.

The food consists largely of small crustaceans.

West Indies to Florida.

W. H. L.

TABLE 3

RANGE OF VARIATION OF DORSAL AND ANAL RAYS IN 99 SPECIMENS OF *Syacium papillosum*

(Column 1 gives number of dorsal rays; column 2, distribution of anal rays for number of dorsal rays shown in column 1; column 3, number of specimens having number of anal rays given in column 2. It is evident that in this species, as in *S. gunteri*, the specimens having the highest number of dorsal rays also tend to have a higher average number of anal rays.)

1	2	3	1	2	3
83.....	68.....	1	88.....	67.....	5
				68.....	2
84.....	63.....	1		69.....	7
	65.....	1		70.....	6
	66.....	4			
	68.....	1	89.....	66.....	1
				67.....	2
85.....	65.....	1		68.....	3
	66.....	1		69.....	4
	67.....	7		70.....	4
	68.....	1			
			90.....	69.....	1
86.....	65.....	1		71.....	3
	66.....	1			
	67.....	4	91.....	70.....	2
	68.....	9		72.....	2
	69.....	3			
	70.....	1	92.....	71.....	1
87.....	64.....	1			
	67.....	7			
	68.....	4			
	69.....	4			
	70.....	2			
	71.....	1			

Syacium gunteri Ginsburg

Syacium gunteri Ginsburg, Proc. U. S. Nat. Mus., vol. 82, 1933, p. 7—12 miles SE. of Barataria Light, Louisiana.

Syacium longleyi Norman, Ann. and Mag. Nat. Hist., ser. 10, vol. 12, 1933, p. 201—off Breton Island, Louisiana.

Not uncommon in the 10-fathom channels; taken also in 13 to 14 fathoms east of Bush Key and Bird Key reef, and as many as 31 in a single haul in 40 fathoms. The largest observed was 165 mm. long.

The female is distinguishable from the male at 68 mm. and upward in length by the postanal extension of the coelomic cavity. The pectoral rays of the ocular side in the male are somewhat prolonged and filamentous, and the width of the

interorbital space at 100 mm. and upward in length exceeds by half that of the female of the same size.

The range in number of fin rays overlaps that of *Syacium papillosum*, but the species are readily separable. (See tables 3 and 4.) They differ even to touch, *S. gunteri* being the harsher, because of a minute difference in the ciliation of its scales on the colored side.

TABLE 4

RANGE OF VARIATION OF DORSAL AND ANAL RAYS IN 31 SPECIMENS OF *Syacium gunteri*

(Column 1 gives number of dorsal rays; column 2, distribution of anal rays for number of dorsal rays shown in column 1; and column 3, number of specimens having number of anal rays given in column 2. It is evident from the table that the specimens having the largest number of dorsal rays also have the largest average number of anal rays.)

1	2	3	1	2	3
75.....	62.....	1	81.....	60.....	1
				62.....	1
76.....	62.....	1		63.....	1
77.....	61.....	1	82.....	64.....	1
	62.....	3		65.....	1
78.....	60.....	1	83.....	65.....	1
	62.....	1		66.....	1
	63.....	2			
			84.....	61.....	1
79.....	60.....	1		67.....	1
	62.....	1			
	63.....	2	85.....	66.....	1
80.....	61.....	1			
	62.....	1			
	63.....	3			
	64.....	1			
	65.....	1			

There is considerable variation in shade in freshly caught specimens, and the color pattern is more distinctly defined in some than in others, but it is basically the same in all. When it is well defined, two-score ocellate and unocellate dark nuclei on body and fins may be easily picked out, which are clearly homologous with those of *S. papillosum*.

Gulf of Mexico.

W. H. L.

Cyclopsetta fimbriata (Goode and Bean)

Nine specimens, up to 280 mm. in length, were taken in four hauls at depths from 10 fathoms on the west side of White Shoal to 65 fathoms south of Tortugas. The fin-ray formulas of two examples are, D. 84, 86; A. 61, 65. The

mottling on iris and sclerotic is of the same order as on the skin about the eye, and extends under the margin of the opaque skin a distance equal to long diameter of pupil.

Gulf of Mexico.

W. H. L.

Citharichthys arctifrons Goode

More than 200 specimens, up to about 100 mm., were taken in ten hauls in 54 to 246 fathoms. The range is undetermined, as the haul at the greatest depth mentioned ended in 144 fathoms. This fish lives at greater depths, however, than *Citharichthys cornutus*.

D. 81 to 84; A. 65 to 68 in 2 specimens; depth 2.6 to 2.8; prominent spine at proximal end of maxillary of left side, of which no mention is made in the original description; knob at mandibular symphysis.

The sexes are distinguishable by the presence in the female of a postanal extension of the coelomic cavity containing the ovaries, which is distinctly visible through the translucent tissue.

Gulf Stream.

W. H. L.

Citharichthys cornutus (Günther)

Rhomboidichthys cornutus Günther, Challenger rept., Zool., vol. 1, 1880, p. 7, pl. 2, fig. B—Brazil.

Citharichthys unicornis Goode, Proc. U. S. Nat. Mus., vol. 3, 1880, p. 342—Gulf Stream SE. of New England.

Rather common; sometimes 50 or more were taken together in 44 to somewhat less than 100 fathoms; apparently most abundant near 65 fathoms. The largest obtained was only a little more than 90 mm. long.

D. 75 to 79; A. 60 to 62 in 6 specimens; scales in lateral line 40 to 41; depth 2.1 to 2.2, not "slightly less than its length," as is stated by Goode and Bean (Ocean. Ichthyol., 1895, p. 444) and repeated by Jordan and Evermann (Bull. U. S. Nat. Mus., No. 47, pt. 3, 1898, p. 2683).

The sexes differ greatly in appearance. Mature males are slightly deeper, with eyes separated by a space equal to long diameter of pupil; with a short spine at mandibular symphysis, 2 before each eye, 1 on end of maxillary, and 1 projecting half diameter of eye beyond contour of body between bases of first and second dorsal rays. In the female the interorbital space is exceedingly narrow, the pre-orbital spines are not developed, and the others are evident only upon close inspection.

At a length of about 55 mm. and upward the sexes are separable at a glance, for the postanal extension of the coelomic cavity, marking the female, is then visible externally.

Gulf Stream.

W. H. L.

Citharichthys macrops Dresel

A single specimen, 145 mm. long, was obtained in the 10-fathom channel east of Loggerhead bank.

D. 85; A. 66; scales large, thin, on the ocular side very weakly ciliate; scales in lateral line with tubes, about 43 to 45. The type has D. 79; A. 57; a specimen from Albatross station 7271 has D. 81; A. 62.

The color pattern is a contrastive one of dark spots, some as large as the eye, scattered freely on a white ground.

W. H. L.

A second specimen, 58 mm. long (standard length 46 mm.), taken west of White Shoal in 7 to 11 fathoms, is doubtfully referred to this species, principally because of its small mouth (approaching therein the genus *Etropus*) and large head. The following enumerations and proportions are based on this specimen, and on 4 others, including the type, ranging in length to base of caudal from 74 to 135 mm. The ranges of the enumerations and proportions of the additional specimens are enclosed in parentheses. D. 82 (77 to 84); A. 63 (57 to 64); scales 40, counting oblique series (38 to 41); gill rakers 16 (13 to 15). Head 3.4 (3.8 to 4.5); depth 2.2 (1.9 to 2.1). Eye in head 3.4 (3.6 to 4.1); snout 5.8 (5.0 to 6.0); maxillary 3.4 (2.5 to 2.8); caudal peduncle 2.55 (1.75 to 2.2); pectoral of ocular side 1.93 (1.3 to 1.7).

It is evident from the foregoing that the small specimen from Tortugas under consideration deviates notably in the proportion of the head and maxillary (which scarcely reaches the pupil, whereas in the other specimens it reaches the middle of the eye), and that it is slightly beyond the limits of the range of the other specimens in several other respects. It also deviates somewhat in color, as the spots are smaller and more regularly placed, being more or less in rows, and the fins, except the caudal, are unspotted. However, much variation in spotting is evident among specimens examined, and may be of no significance.

The type, and some specimens taken off the coast of North Carolina, agree with the Tortugas fish in having a fairly definitely pointed caudal fin, whereas the other Florida specimens have a rounded caudal. Norman (Flatfishes, vol. 1, 1934, p. 147, fig. 100) apparently erred in stating that the 1st ray of the dorsal is longer than the succeeding ones, as in all the specimens at hand the immediately succeeding ones are fully as long as the 1st.

Because of the rather numerous differences that appear to exist among specimens commonly identified as *Citharichthys macrops*, it may be found, from a more comprehensive study, that more than one species is included.

South Atlantic and Gulf coast of the United States.

S. F. H.

Etropus Jordan and Gilbert, 1881

Parr (Bull. Bingham Oceanog. Coll., vol. 4, art. 1, 1931) united this genus with *Citharichthys*, stating that, according to authors, *Citharichthys* differs from *Etropus* "only in the very small size of the mouth and in the correspondingly weak dentition," and that his own observations showed it to be impracticable to base a generic subdivision upon that feature alone. Parr then showed by measurements that there is no clear division in the size of the mouth among the species commonly assigned to these two genera, though the differences in the extremes are comparatively great. Norman (Flatfishes, vol. 1, 1934), however, whose

nomenclature of genera has been adopted herein, did not see fit to follow Parr. It is evident from the present study that closely related species differ in the size of the mouth, and that there may be considerable variation within a species (see under *C. macrops*).

S. F. H.

***Etropus rimosus* Goode and Bean**

Two poorly preserved specimens, 90 and 92 mm. long, without definite data, belong here, as shown by comparison with the type (U. S. Nat. Mus. no. 37332). Though the scales on the body are lost, strongly ctenoid ones remain on the snout. The pectoral on the ocular side is notably the larger and longer, a fact not stated in descriptions consulted.

The color of preserved specimens is grayish. The only marking evident is an obscure dark blotch in lateral line about an eye's diameter in advance of end of bases of dorsal and anal, which is present also in the type.

The following proportions and enumerations are based on the 2 Tortugas specimens: Head 4.35, 4.45; depth 2.0, 2.0; pectoral (ocular side) 4.5, 4.7. Eye in head 3.3, 3.4; snout 6.6, 6.8; maxillary 4.5, 4.6; caudal peduncle 1.85, 2.0. D. 77, 81; A. 61, 62; P. 10, 10 on ocular side, 8, 8 on blind side; scales (pockets) 39, 41; gill rakers 6, 6 (only 5 in type).

Gulf of Mexico.

S. F. H.

***Trichopsetta ventralis* (Goode and Bean)**

Thirty-three specimens, 89 to 228 mm. long, were taken in nine hauls in 40 to 100 fathoms.

D. 89 to 93; A. 70 to 74 in 4 specimens. P. 8 or 9 on blind side, 12 on other side; scales 66 or 67 in 3 specimens.

Very delicately colored with palest of gray, faintly tinged with yellow; body and fins dotted sparsely with darker gray, the markings commonly consisting of circles varying from less than size of pupil to size of eye; a larger, darker, and more irregular spot at anterior end of straight part of lateral line.

The male is distinguished by the elongated right ventral, and a dark spot on the anterior part of the anal fin.

Deep water in Gulf of Mexico.

W. H. L.

***Engyophrys sentus* Ginsburg**

Engyophrys n. sp. Longley, Carnegie Inst. Wash. Year Book No. 30, 1931, p. 386—Tortugas, Florida (listed without description).

Engyophrys sentus Ginsburg, Proc. U. S. Nat. Mus., vol. 82, art. 20, 1933, p. 6—off Dry Tortugas, Florida, in 50 fathoms.

About 24 specimens, 75 to 100 mm. long, were taken in 43 to 65 fathoms.

In 5 examined the fin formulas are, D. 73 to 82; A. 60 to 64. In a specimen 100 mm. long, 88 mm. standard length, the head measures 18 mm. (4.9), depth 48 mm. (1.8), and eye 5.0 mm. (3.6 in head). Maxillary short, not reaching eye; teeth in both jaws on blind side only, in single series, small and close-set, inclined inward; none on vomer or palatines; gill rakers very small, 4 to 6 on lower limb of first arch; 3 preorbital spines on left, 2 on right; interorbital ridge narrow,

with 3 or 4 retrorse spines above and 1 terminating it posteriorly; lateral line on blind side obscure or obsolete, on colored side strongly arched above pectoral, base of arch about one-quarter length of straight part; scales on colored side ctenoid, 51 or 52 in lateral line with pores, cycloid on blind side; pectorals with 11 rays each, tip of the fin on eyed side reaching beyond arch in lateral line.

Six males, 80 to 100 mm. in length, have each six black bars on the blind side, the ground color of this side being ashy gray. The eyed side is gray with three dark spots almost equally spaced along the straight part of the lateral line, three smaller ones at bases of dorsal and ventral fins, and an imperfect bar at base of caudal. Two females, 75 to 80 mm. long, show no trace of bars on the under side.

Known only from Tortugas.

W. H. L.

***Monolene antillarum* Norman**

Monolene antillarum Norman, Ann. and Mag. Nat. Hist., ser. 10, vol. 12, 1933, p. 204—off Barbados; Flatfishes, vol. 1, 1934, p. 166, fig. 118.

Specimens 75 to 170 mm. long were taken very commonly in 85 to 180 fathoms south of Tortugas.

W. H. L.

The southern specimens were considered identical with the more northern ones, *Monolene sessilicauda* Goode, until Norman (see citations above) recognized them as distinct. The relation seems so close, however, that the southern form probably should be considered only a subspecies. Norman has stated that the body in *M. antillarum* usually is a little more slender, the head apparently longer, eye larger, and scales fewer. That the differences in all these respects are small is evident from the proportions and counts given by Norman, as well as from those that follow.

The following enumerations and proportions are based on Florida specimens, and on a paratype of *M. sessilicauda* from 40° 02' 26" N., 70° 22' 58" W. (U. S. Nat. Mus. no. 26002). The proportions and enumerations based on the paratype, which is 74 mm. long to base of caudal, are enclosed in parentheses. The other specimens are 97 and 109 mm. long to base of caudal. Head 5.5, 4.6 (4.9); depth 2.9, 3.3 (2.8). Eye in head 3.5, 2.8 (3.75); snout 5.0, 5.5 (5.3); maxillary 4.0, 3.7 (3.25). D. 96, 97, 100, 102 (103); A. 79, 80, 81, 82 (79); scales 80, 80, 85 (about 90, many scales lost; 92 in original description).

The longer maxillary, which reaches the anterior margin of the eye in Florida specimens, whereas it reaches to the pupil in the northern one, is the most evident difference. It is noteworthy also that although the northern specimen is the smallest, its eye is proportionately the smallest. The scales cannot be counted accurately in the paratype of *M. sessilicauda*, but they appear to be rather smaller, and more numerous on the rays of the dorsal and anal, as well as in the longitudinal series. The paratype has approximately 19 rows above the lateral line and approximately 21 below it, whereas the Florida specimens have about 16 above and about 18 below.

It is evident that more specimens must be studied to determine the exact relationship.

*West Indies to Florida.

S. F. H.

Bothus ocellatus (Agassiz)

Rhombus ocellatus Agassiz, in Spix, Pisc. brasil., 1831, p. 85, pl. 46—Brazil.

Rhomboidichthys spinosus Poey, Repertorio, vol. 2, 1868, p. 409—Cuba.

Platophrys nebularis Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 7, 1884 (1885), pp. 31, 143—Key West, Florida.

Small specimens were taken in shallow water along sandy shores, and larger ones in 10-fathom channels. Outside the lagoon specimens were taken at depths apparently not exceeding 60 fathoms.

TABLE 5

RANGE OF VARIATION OF DORSAL AND ANAL RAYS IN 86 SPECIMENS OF *Bothus ocellatus*

(Column 1 gives number of dorsal rays; column 2, distribution of anal rays for number of dorsal rays shown in column 1; column 3, number of specimens having number of anal rays given in column 2. It will be seen that the specimens having the largest number of dorsal rays also tend to have the largest average number of anal rays.)

1	2	3	1	2	3
78.....	62.....	1	85.....	63.....	2
				64.....	3
79.....	58.....	1		65.....	2
				66.....	1
80.....	62.....	4	86.....	59.....	1
	64.....	1		62.....	1
81.....	60.....	1		63.....	2
	61.....	1		64.....	4
	63.....	2		65.....	3
	64.....	1	87.....	63.....	2
82.....	60.....	1		64.....	3
	61.....	2		65.....	3
	62.....	3		66.....	4
	63.....	1	88.....	65.....	2
83.....	61.....	2		66.....	2
	62.....	8		67.....	2
	63.....	2	89.....	65.....	3
	64.....	2		67.....	1
	65.....	1			
84.....	62.....	2			
	63.....	5			
	64.....	2			
	65.....	2			

The range in dorsal rays in 86 specimens from Tortugas is 78 to 89, and in anal rays 58 to 67, as shown in table 5. P. 9 or 10 in a sample of 6.

In large males the upper ray of the pectoral is greatly elongated, being twice as long as the second. Males are distinguished, furthermore, by the greater inter-

orbital width, by details of coloration mentioned below, and at about 85 mm. and upward in length, by the nasal spine.

The color is readily changeable. Changes occur when the fish are handled, and also in adaptation to the bottom. If transferred from slabs of slate to white sand, or vice versa, readjustment may be completed in 10 to 15 seconds.

In dark phases the eyed side is clouded with dark gray, with darker nuclei, including four submarginal ones following the dorsal contour, three similarly following the ventral, and three equally spaced along the straight part of the lateral line. In intermediate phases the ground color is drab with scattered circular and elliptical spots of cream. The light areas are commonly lightest, and the dark ones irregularly darker, at their periphery. In the male the preocular region is streaked with blue lines with dashes of yellow between.

If wave motion does not speedily bed the fish by sweeping grains of sand upon it and effacing its outline, the creature does it by a shivering motion. In the bedded fish the eyes may sink within the orbits until they are flush with the general level, or rise till they project to the extent of their full diameter and are all of the fish that remains exposed.

Tropical America; Brazil northward to New York.

W. H. L.

Family PLEURONECTIDAE

The Pleuronectidae normally have the eyes and color on the right side.

S. F. H.

Poecilopsetta beanii (Goode)

This species is common at depths of 110 to 285 fathoms, but occurs also in 65 fathoms. The fish collected range in length from 73 to 160 mm.

The back is freckled with yellow, and has nine white blotches near base of dorsal and eight at base of anal, giving the fish a checkered appearance along the borders; caudal fin with a pair of black spots, each larger than eye; blind side with four longitudinal rows of black spots, half diameter of pupil, most conspicuous in the transparent young 75 mm. or less in length, but sometimes still recognizable in the largest fish taken.

Deep water, from New England to Florida.

W. H. L.

Family ACHIRIDAE. BROAD SOLES

Nodogymnus williamsoni Gunter

Nodogymnus williamsoni Gunter, Copeia, No. 4, 1936, p. 203, figs. 1, 4, 5—West Pass of Apalachicola Bay, Florida.

One specimen 130 mm. long, taken in 50 to 58 fathoms, belongs to this species, as was determined by comparing it with the type. •

Dr. Longley has the following data: D. 65; A. 46; P. on ocular side with 2 filamentous rays; lips, tips of rays, margin of operculum, and under side of head fringed; lines of cirri on the latter forming a netted pattern; eyes close together;

nostrils at preorbital border, left one opening upward, right one downward.

Ground color faintly olivaceous, crossed by brown bands of an average width a little less than long diameter of eye, not quite as wide as the interspaces, and curved backward dorsally and ventrally; seventeen dark bands across mid-line of fish, and three more darker ones on caudal fin; most of the interspaces divided wholly or partly by bars of lighter brown than the main bands; outer face of each eye with horizontal line of brown of width of pupil crossing iris, which has a pattern of radial streaks about it.

Little change has taken place in color, which agrees except in minor details with the type. So far as I am able to judge from descriptions, the color constitutes the chief diagnostic character.

As the fins are enveloped in skin, the rays are rather difficult to count, and the enumerations given in descriptions cannot be relied upon too confidently. In the Tortugas specimen, however, the rays can be counted fairly accurately. It seems significant that, in counts made independently, Dr. Longley enumerated only one more ray in each median fin than I did. I have recounted as carefully as possible, without dissection, the dorsal and anal rays in the type. The anal ray count seems to be correctly given as 47 in the original description, but the dorsal count of "about 70" rays seems too high, as I am able to count only about 60.¹

The following measurements and enumerations are based on the Tortugas specimen and the type. The proportions and counts of the type are enclosed in parentheses. Head 4.8 (5.25); depth 1.7 (1.5). Eye in head 3.8 (4.2); snout 3.2 (3.0); maxillary 3.0 (2.9). D. 64 (about 60); A. 45 (47); P. 2 rudimentary rays on ocular side (represented only by a papilla); V. 5 (5).

Gulf of Mexico.

S. F. H.

Family CYNOGLOSSIDAE. TONGUEFISHES

Symphurus diomedeanus (Goode and Bean)

One specimen with injured head, 115 mm. long, taken in 80 to 100 fathoms, is at hand.

The Tortugas fish was compared with the type, with which it seems to agree fairly well except in color. The differences may be ascribed to age, as the type is a larger specimen, being 150 mm. long. The smaller Tortugas specimen has indefinite dark spots, arranged more or less in longitudinal rows; also indications of dark spots on the posterior fourth or so of the dorsal and anal fins. The type is plain in color, except for several black spots on the posterior parts of the dorsal and anal, which are notably more prominent than in the Tortugas fish.

The following enumerations are based on the Tortugas specimen and the type. Those of the type are enclosed in parentheses. D. 91 (96); A. 82 (79); scales about 100 (about 85).

Gulf of Mexico.

S. F. H.

¹ Since this account was prepared, Gunter (Copeia, No. 4, 1939, p. 188) has described 4 additional specimens. He found that the number of dorsal rays given in the original description was too high. Comparisons with related species are made.

Symphurus pusillus (Goode and Bean)

Three specimens, 113, 131, and 133 mm. long, taken in 140 to 197 fathoms, and a fourth one, 112 mm. long, without data, are included in the collection.

It is not evident, either from descriptions or from the few specimens examined, wherein *Symphurus pusillus* and *S. plagiusa* differ. The chief reasons for placing the Tortugas specimens with *S. pusillus* are, first, that they are from deep water (*S. plagiusa* supposedly being a shallow-water form), and, second, that the color is in agreement with Goode and Bean's figure (Ocean. Ichthyol., 1895, p. 461, fig. 379), being very definitely more distinctly barred (having seven or eight black bars) than shallow-water specimens (*S. plagiusa*) from Beaufort, North Carolina.

Depth 3.0 in all 4 specimens. D. 78; A. 67; about 75 oblique series of scales along middle of ocular side in one specimen counted.

Off Atlantic coast of the United States in deep water.

S. F. H.

Family ZEIDAE. JOHN DORIES

Zenopsis ocellata (Storer)

Dr. Longley listed 1 specimen taken in 80 fathoms, and 3 in 80 to 100 fathoms, but he has the note "Probably pelagic." As the net was not closed when lifted, it is possible that the fish entered at or near the surface. At any rate, the species of this genus generally have been listed as pelagic.

The collection includes 4 specimens, 65, 100, 112, and 122 mm. long, which presumably are the same ones listed by Dr. Longley in his field data. As few specimens have been taken of this species, for which no detailed description has been published, and as the European species, *Zenopsis conchifer* (Lowe), is a rather close relative, it seems advisable to offer a description of the Tortugas material. Fowler (Proc. Acad. Nat. Sci. Philadelphia, vol. 86, 1934, p. 358) indeed has placed *ocellata* in the synonymy of *conchifer*.

Body deep, very strongly compressed; head narrow, with slightly concave upper outline; a ridge over each eye, with a few spines behind eye, and a pair at occiput; spines largest in smallest specimen; mouth rather large, strongly oblique; a pair of spines present on dentary bones near tip of lower jaw, and a prominent one, slightly curved at tip, at base of each dentary bone; gill rakers very short, 9 or 10 somewhat developed on lower limb of first arch; lateral line with high arch anteriorly, longer than straight part; scales wanting; bony plates or bucklers on median line of chest and abdomen and along bases of dorsal and anal fins; small plate with 2 sharp spines situated on isthmus; a second very large one just in front of ventrals, with a very low single median spine, and with a pair of prominent spines posteriorly, directed backward; another single plate between ventrals, and 7 double ones, each with a backward-projecting spine, between ventrals and anal; 4 or 5 more on each side of base of anal, each with a recurved spine; and 6 or 7 similar ones, each with a hooked spine, along base of dorsal.

Spiny and soft-rayed parts of dorsal not entirely separate; soft rays, as well as posterior spines, rather low, anterior spines high, 1st to 4th highest, with filaments reaching far beyond tip of caudal in smallest specimen, only about opposite beginning of posterior fourth of soft dorsal in one of the larger specimens; margin of caudal straight to slightly concave, not "rounded" as stated in current descriptions; anal spines short and strong, soft part of anal similar to that of dorsal; ventrals large and long, reaching scarcely to origin of anal in the 100-mm. specimen, and opposite 3d anal spine in the 65-mm. one, indicating that these fins decrease in length with age; first 2 rays of ventrals closely adjoined, not readily separable, though apparently counted as 2, a spine and a soft ray, by ichthyologists, and so given in the counts presented below; pectoral fins short and broad, only about as long as snout.

The following proportions and enumerations are based on the 4 specimens at hand: Head 2.4 to 2.6; depth 1.3 to 1.5. Eye in head 3.3 to 4.1; snout 2.4 to 2.6; maxillary 2.2 to 2.4; interorbital 5.2 to 5.35; caudal peduncle 7.2 to 8.4; pectoral 2.4 to 2.9; first anal spine 2.8 to 3.8. D. VIII or IX, 25 to 28; A. III, 24 to 26; P. 12 or 13; V. 1.5 or 6; gill rakers 9 or 10.

Dr. Longley noted that the color of fresh specimens was "silvery, spotted." This color has been retained in the preserved specimens. Black to dusky spots, scattered all over body, remain distinct, rather more prominent on smallest specimen than the others; largest and most distinct spot about an eye's diameter behind upper blunt point on margin of opercle, with a smaller spot a little in advance of it and a little higher on the body scarcely less distinct; each spine surmounting a bony plate along bases of dorsal and anal surrounded at base with black; median line of head with black spots, more or less united to form a streak in one of the larger specimens; lower jaw mostly dusky; the spinous dorsal and the ventrals profusely spotted with black; soft part of dorsal, and anal and pectorals plain; caudal with a more or less distinct bar (two spots, one above and one below, in smallest specimen) at base, then pale, and distally dusky.

This species was recorded from the offshore waters of New England, where the type was taken, in 1858. Thereafter no new specimens seem to have been reported until 1913, when J. T. Nichols (Amer. Mus. Jour., vol. 13, p. 44) mentioned a half-dozen specimens taken on the outer continental shelf at 39° 39' N., 72° 07' W. In 1934 Fowler (see reference above) recorded three specimens off Cape May, New Jersey, under the name *Zenopsis conchifer*. S. F. H.

Zenion hololepis (Goode and Bean)

Two specimens are listed in Dr. Longley's field data, presumably the smaller one at hand, about 52 mm. long, having been taken in 220 to 237 fathoms, and the larger one, about 80 mm. long, in 200 to 253 fathoms.

These fish, which were described as red when taken, have become pale in spirits. They are in such poor condition now that accurate enumerations and proportional measurements of most parts cannot be made. The dorsal in one specimen definitely has VII, 27 rays; its 1st spine short, 2d long and strong, a

little longer than the very large eye; its anterior edge definitely rough; ventral spine fully as long as 2d dorsal, equally rough on outer margin; premaxillaries exceedingly protractile; scales distinct, rather deep, and without free margins.

West Indies to Florida in deep water.

S. F. H.

Family POLYMIXIIDAE. BARBUDOS

Polymixia lowei Günther

The collection contains 3 specimens, each about 80 mm. Two are without definite data, and the third was removed from the stomach of a flounder, *Paralichthys oblongus*, taken in 168 fathoms. Dr. Longley listed 7 specimens, 2 from 45 to 60 fathoms, and 5 from 140 to 197 fathoms.

An error concerning the structure of the scales appears in the literature. This error apparently originated with Günther's description of *Polymixia lowei* (Cat. fish. Brit. Mus., vol. 1, 1859, p. 17), wherein the scales were described as having "distinct concentric layers on the free part and [being] without serrature." The scales are strongly serrate in the Tortugas specimens, which not only bear spines along the distal margins, but have in most cases two rows of spines on the exposed surface in advance of the margin. Poey (Memorias, vol. 2, 1860, p. 161) described the scales as definitely ciliate ("à bord fortement cilié") in his *Dinemus venustus*, here regarded as a synonym of *P. lowei*. Günther's figure of *P. nobilis* (here regarded as a synonym of *P. lowei*) in his *Deep-sea fishes* (1887, p. 34, pl. I, fig. B), however, showed serrated scales. Gill (Johnson's Universal Cyclopaedia, vol. 3, 1878, p. 1323) in his description of the family Polymixiidae followed Günther's description of *P. lowei*, stating, "the scales are not serrated." This error, apparently a mere "slip of the pen" on Günther's part, has been repeated several times by other authors.

Most descriptions state that the anal has only 3 spines. All 6 specimens from Tortugas examined by Dr. Longley, however, 2 of which I also examined, had 4. It has been stated that the ventral rays are all articulated, also that a spine is present. Actually the so-called spine and the 1st ray are almost fused and can be separated only with a sharp instrument.

The following proportions and enumerations are based on the 2 specimens in hand, with the exception of the dorsal, anal, and pectoral counts, which include 4 additional specimens examined by Dr. Longley. Head 3.1, 3.1; depth 2.6, 2.8. Eye in head 3.2, 3.2; snout 5.0, 5.0; interorbital 3.3, 3.4; maxillary 1.8, 1.8; caudal peduncle 2.8, 2.8; pectoral 1.55, 1.65; ventral 2.2, 2.4. D. V, 26 to 28; A. IV, 15; P. 14 to 16; V. 7, 7 (counting the 1st fused "spine" and soft ray as one); oblique series of scales between upper angle of opercle and base of caudal 59, 61; gill rakers 10, 11.

Dr. Longley described the color as "bluish over black; sides silvery." This color has been retained in the preserved specimens.

The species apparently was previously recorded only from Cuba. It seems to live in moderately deep water.

S. F. H.

Family TRACHICHTHYIDAE

Hoplostethus mediterraneus Cuvier and Valenciennes

The collection contains 1 specimen, 46 mm. long to base of caudal, in poor condition. Depth in standard length 2.4. D. VI,13; A. III,10; V. I,6; scales lost, except the modified ones on the abdomen, which bear spines.

This species has been reported in the western Atlantic from the Gulf Stream and once from Chesapeake Bay, generally at depths exceeding 150 fathoms. Although the Tortugas specimen is without a definite locality label, it very probably was taken south of Tortugas, where hauls were made in depths as great as about 390 fathoms.

S. F. H.

Family HOLOCENTRIDAE. SQUIRRELFISHES

Holocentrus ascensionis (Osbeck)

(Plate 2, figure 1)

This, largest and most brightly colored of the three Tortugas squirrelfishes, is far more abundant than the casual observer would suppose, as it is most active by night and generally remains hidden by day. Single specimens are exposed to view now and then, but more characteristic are the fleeting glimpses one catches of fish moving in the thick shadow of *Acropora* or in the semidarkness of deep crevices in massive *Orbicella*. Sometimes on cloudy days a dozen or so may come out into the open, or a strong ground swell may tug them out. In the dusk of evening they usually leave their retreats, and remain abroad till morning. In a hollow *Orbicella* on White Shoal, where other shelter was almost completely wanting and where more than a single squirrelfish was never seen at once, one specimen was observed repeatedly during a month, suggesting that these fish, like many others, have places to which they return regularly after a night's foraging.

In the dead fish the fins, except the spinous dorsal, which is yellowish, are transparent and more or less suffused with red. Head red; body countershaded, with longitudinal stripes of red between rows of scales and separated by pale interspaces. The living fish is not always so red, nor does it always show the simple pattern of the dead, as it may be blotched or clouded with red and silver.

This species occurs in association with others with which it shares some of its peculiarities of color and structure. For example, a single blast, which probably was not effective beyond a radius of 2 meters, yielded 2 specimens of *Holocentrus ascensionis*, 2 *H. coruscus*, and 1 *Priacanthus cruentatus*.

W. H. L.

This species is most readily distinguished from the other local forms by the smaller scales (about 48 to 52 in lateral series, whereas the others have only about 40 to 42). It also has a larger number of gill rakers (13 to 15 on lower limb of first arch, compared with 10 or 11 in the others). Furthermore, the ventrals are longer, extending far beyond the pectorals and reaching the vent.

West Indies to Florida, also from St. Helena and Ascension Island. S. F. H.

***Holocentrus coruscus* (Poey)**

Holocentrum coruscum Poey, Memorias, vol. 2, 1860, p. 158—Cuba.

Holocentrus tortugae Jordan and Thompson, Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 236, fig. 1—Garden Key, Tortugas, Florida.

Holocentrus puncticulatus Barbour, Bull. Mus. Comp. Zoöl., vol. 46, 1905, p. 117—Bermuda.

This species is not rare in reef patches or in isolated hollow coral heads. Like *Holocentrus ascensionis* and *H. vexillarius*, it is nocturnal.

Holocentrus coruscus, at least when mature, is very readily distinguished from *H. vexillarius* by its slighter build (depth 3.5 *vs.* 2.9 in standard length), by its black spot on the dorsal fin, its lack of yellow on the soft dorsal and caudal fins, its generally redder color, and the more glistening silver streaks on the rows of scales, much narrower dorsally than in *H. vexillarius*. The spines between the border of the premaxillary groove and the nostrils are longer and stronger in *H. coruscus*, and include a particularly strong one above the posterior aperture, where the other species has none, but there is no spine between the posterior narial border and the eye, where one appears in *H. vexillarius*. The supraorbital ridge in *H. coruscus* is almost smooth, but strongly serrate in the other and much more spinose mesially.

Three specimens, taken in the morning, had fed on small shrimps and crabs.

Head with a red line below and behind eye extending to below posterior angle of preopercle; a fainter line parallel with the first extending back from tip of mandible to anterior end of interopercle; cheek otherwise brilliant white; lower jaw and its membranes below scarcely different. Body with alternating red and silvery lines; membranes between dorsal spines tipped with white outwardly, the remainder of the outer half or two-thirds of fin with a longitudinal red band, replaced by black nearly to 3d spine, and white ventrally to this; spines red; soft dorsal and caudal reddish; pectorals and ventrals almost colorless and transparent; anal reddish from 3d spine to 2d soft ray.

West Indies, and northward to Florida.

W. H. L.

***Holocentrus vexillarius* (Poey)**

Holocentrum vexillarium Poey, Memorias, vol. 2, 1860, p. 158—Cuba.

Holocentrum sicciferum Cope, Trans. Amer. Philos. Soc., vol. 14, 1871, p. 465—New Providence, Bahamas.

Holocentrus siccifer Jordan and Thompson, Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 236. Gudger, Carnegie Inst. Wash. Pub. 391, 1929, p. 160.

Holocentrus coruscus Beebe and Tee-Van (at least in part not of Poey), Zoologica, vol. 10, 1928, p. 80—Port-au-Prince Bay, Haiti.

Holocentrus coruscus Metzelaar (not of Poey), Trop. atl. Vissch., 1919, p. 43, fig. 15.

This species is intermediate in size between *Holocentrus ascensionis* and *H. coruscus*. Its habits are very much like theirs, and like them it feeds by night and lies hidden by day. A specimen 41 mm. long was included in collections from Bird Key rookery.

It has the alternating lines displayed by fish of this genus, but its general cast is brown rather than red. Its cheek is dusky except for a red dash from below

eye to above preopercular spine, and the lower jaw and membrane between its rami are dark-pigmented.

Beebe and Tee-Van's specimen (see citation above), with depth equal to head and contained 2.83 times in standard length, has the proportions of *H. vexillarius* rather than *H. coruscus*. The two opercular spines equal or with the lower slightly larger, as is indicated in their diagrammatic sketch, characterize the former species. W. H. L.

The vertical black bars on the interradi al membranes of the spinous dorsal, in contrast with the large black spot involving the first 3 spines in *H. coruscus*, are very useful in separating preserved specimens. Also, the pectoral fins are longer, reaching nearly to tips of ventrals, and are contained in head 1.3 times, whereas in *H. coruscus* they fall far short of reaching tips of ventrals, and are contained in head 1.7 times. A rather constant difference appears to exist also in the number of anal rays, *H. vexillarius* having 9 soft rays, and *H. coruscus* only 7.

West Indies and northward at least to Florida.

S. F. H.

Myripristis jacobus Cuvier and Valenciennes

A specimen 87 mm. long, without data, is included in the collection. No mention of this specimen or species was found among Dr. Longley's notes.

The genus *Myripristis* differs from *Holocentrus* in the absence of a spine at the angle of the preopercle. The specimen in hand differs from other holocentrids from Tortugas also in the more numerous anal rays and gill rakers. The eye is very large, the snout short and broad, and the serrated suborbital very narrow, being scarcely half as wide as the pupil.

The preserved specimen is rather plain, the only color remaining being a dark brown margin on the opercle and the axil of the pectoral.

The following proportions and enumerations are based on the specimen at hand: Head 3.3; depth 3.3. Eye in head 2.25; snout 6.5; interorbital 4.4; maxillary 1.8; caudal peduncle 4.3; longest anal spine 2.7; pectoral 1.5; ventral 1.6. D. X-1,15; A. IV,13; scales 36; gill rakers 25.

This species apparently has not previously been recorded from Florida, its earlier known range being West Indies, Panama, and Brazil. S. F. H.

Family SYNGNATHIDAE. PIPEFISHES; SEA HORSES

The pipefishes are not very well defined, and from present knowledge are difficult to identify. As an aid to the student who may use this work, a key embodying some diagnostic characters is offered.

Dr. Longley has pointed out one or more instances, in the following accounts, of abnormally few caudal rings. Besides the instances mentioned by him, some additional specimens with abnormally short tails, yet having caudal fins, are included in the Tortugas collection. I have seen cases of this also among pipefishes from other localities. It does not seem very unusual for a pipefish to lose by accident a part of its tail, whereupon it develops a new caudal fin on the remaining part. S. F. H.

KEY TO THE SPECIES

- a. Tail not prehensile; head not shaped like that of a horse, and not at right angle to axis of body
 - b. Body strongly angulate, quadrate in cross section
 - c. Snout of moderate length, about 2.4 in head; rings about $18 + 30$; keels on snout and head distinctly serrate; body with grayish crossbands; snout abruptly white . . . *Hippichthys albirostris*
 - cc. Snout very short, about 3.0 in head; rings $17 + 26$ or 27 ; keels on snout and head not serrate (in adults); body without crossbands; snout not white *H. brachycephalus*
 - bb. Body not very strongly angulate, usually not quadrate in cross section
 - d. Median lateral keel (lateral line) bent downward on last two body segments and continuous with inferior lateral keel of tail; D. 18 to 21, on 1 or $1\frac{1}{2} + 4$ or 5 rings; snout very short, 3.4 to 4.0 in head *Syngnathus jonesi*
 - dd. Median lateral keel ending abruptly, generally on last body ring, not continuous with inferior lateral caudal keel
 - e. Dorsal fin short, with 20 to 25 rays
 - f. Snout curved upward slightly, short, 3.0 to 3.5 in head; a light triangular spot behind eye; radiating lines on eye *S. dunckeri*
 - ff. Snout not curved upward, longer, about 2.0 in head; light spot behind eye missing
 - g. Snout moderately long, 2.0 to 2.1 in head; eye 3.6 to 3.8 in snout; lower part of opercle with pale oblique lines *S. robertsi*
 - gg. Snout rather longer, 1.8 to 2.0 in head; eye 4.0 to 4.3 in snout; opercle plain, without pale lines . . . *S. elucens*
 - ee. Dorsal fin longer, with 27 or more rays
 - h. Dorsal fin moderately long, with 27 to 33 rays, over 1 to $2\frac{1}{2} + 4$ to 6 rings; body rings 16 to 18
 - i. Keels of head and body rather prominent, distinctly beaded; rings 16 to $18 + 32$ to 35; D. 27 to 29, over $1\frac{1}{2}$ or $2 + 4$ or 5 rings; female with a narrow silvery half-bar on lower half of each ring of trunk, male with silvery spots on inferior lateral keel of trunk *S. rousseau*
 - ii. Keels of head and body less prominent, smooth (not beaded); rings 17 or $18 + 34$ to 37; D. 27 to 33, over 1 to $2\frac{1}{2} + 5\frac{1}{2}$ to 6 rings; silvery half-bars or spots on lower part of trunk missing *S. floridae*
 - hh. Dorsal fin very long, with 34 to 37 rays, over 3 or $4 + 4$ or 5 rings; rings 19 to $22 + 33$ to 37 . . . *S. louisianae*
 - aa. Tail prehensile; head shaped like that of a horse, at right angle to axis of body *Hippocampus punctulatus*

***Hippichthys albirostris* (Heckel)**

One male, 182 mm. long, carrying young, was dredged in the 10-fathom channel east of Loggerhead bank.

D. 22 on 1 + 4 rings; rings 18 + 30, brood pouch covering 19. Median keel on snout in two sections; this keel, the supraorbital keels, and the nuchal and occipital keels all of moderate height, and very distinctly serrate; the short and slightly oblique ridge on side of rostrum, the suprabranchial and opercular ridges, and two on base of pectoral all less strongly toothed. Short, mostly simple cirri, generally less than half diameter of eye, on some keels of head, and on throat, trunk, and tail.

General color brown; snout sharply white; oblique streaks of white under throat and on gill covers; fine pattern of radiating light and dark lines on envelope of eye and on iris; ground color crossed by faint and diffuse gray bands, the first on postorbital part of head, three on trunk, and seven on tail.

W. H. L.

Two additional specimens, females, 105 and 145 mm. long, are included in the Tortugas collection. Comparing the larger female with the large male described by Dr. Longley, it is evident that the female is much more distinctly marked with light gray crossbands, and that the cirri on the head are much longer. The following proportions and enumerations are based on the female: Head 9.2. Depth in head 2.4; eye 6.5; snout 2.4; interorbital 7.2; length of dorsal base 1.1; pectoral 5. D. 22, over $\frac{1}{2}$ + 5 rings; P. 14; rings 17 + 29.

The sharply angular, quadrate body, which is scarcely deeper than wide, the abruptly white snout, the grayish crossbands, the oblique pale lines under the head, and the radiating lines on the eye are good recognition marks.

Florida to Brazil.

S. F. H.

***Hippichthys brachycephalus* (Poey)**

Syngnathus brachycephalus Poey, Repertorio, vol. 2, 1868, p. 444—Havana.

Corythoichthys cayorum Evermann and Kendall, Bull. U. S. Fish Comm., vol. 17, 1897 (1898), p. 128, pl. 7, fig. 7—Key West, Florida.

This fish is common on grassy flats about Long Key and Bird Key reef. It is not difficult to secure at Tortugas specimens of *Corythoichthys cayorum* which agree closely with the precise account of *Syngnathus brachycephalus* by Poey.

In a male of the same length as the type of *S. brachycephalus*, the number of rings in trunk and tail, the number of dorsal rays, and the ratio of preanal to postanal length, of thickness to segmental width, and of eye to preorbital and postorbital length of head are all as stated in the original description. The dimensions or enumerations as observed (for comparison, Poey's corresponding records are placed in parentheses), are as follows: Head 4.0 (4.3); depth equals width of 3.5 (4.0) segments; dorsal fin over $1\frac{1}{2}$ + 4 ($1\frac{1}{2}$ + 3) rings. The range of variation in specimens examined is as follows: D. 21 to 24, on $1\frac{1}{2}$ to 2 + 4 or 5 rings; P. 13 to 14; C. 10; rings 17 + 26 to 27; brood pouch on 18 to 20 rings.

Small cirri, including some that are pinnate, on keels of head and body and under throat. Median crest of snout may be continuous with occipital crest, or interrupted in interorbital space.

In the Museum of Comparative Zoölogy are still 2 specimens, received from Poey in 1868, which fairly represent either nominal species in everything but color, and are quite unlike any other species mentioned by Poey.

This species may be taken in breeding condition from at least June to August inclusive. About 100 young are carried at once in the brood pouch of the male, where through the greater part of its length they lie in four rows.

In ground color individuals differ considerably. Some are rather dark brown; in others the head, roughly the area occupied by the brood pouch, and several segments before the caudal are paler and tend distinctly toward olive; snout, throat, and gill covers obliquely banded with white laterally and ventrally. A fine speckling of light spots spreads a faint grayish bloom over the back and sides of the trunk and tail.

The strongly angulate body and the excessively short snout, which is contained about 3.0 times in the head, help to distinguish this species. Comparing it with *Hippichthys albirostris*, it apparently attains a smaller size (usual length under 100 mm.), and has fewer caudal rings, a shorter snout, keels on head not serrate in adults, and no crossbands on body.

West Indies to Florida.

W. H. L.

Syngnathus jonesi Günther

Two specimens are mentioned in Dr. Longley's notes, taken on grassy bottom at Bush and Long keys. In the manuscript is a preliminary account of 2 specimens, 67 and 80 mm. long, taken at Bush and Long keys, listed as *Syngnathus crinigerum*. Two specimens of the lengths mentioned, questionably identified as *S. crinigerum* Bean and Dresel, indeed are included in the collection, as well as 6 others, ranging in length from 50 to 102 mm.

The specimens from Tortugas were compared with the 2 type specimens of *S. crinigerum* in the U. S. National Museum. The types differ in the length and position of the dorsal fin, which has only 16 or 17 rays, and is situated over $0 + 4$ rings, and the rings in the types are $16 + 35$ in one and $16 + 36$ in the other. These counts agree essentially with the original description of *S. crinigerum*, and not with the description of *S. jonesi*, nor with the counts listed subsequently, based on Tortugas specimens. In view of these facts I refer the Tortugas specimens to *S. jonesi*.

The median lateral keel is bent downward on the last two body rings, and is continuous with the inferior lateral keel of the tail. Therein *S. jonesi* and *S. crinigerum* agree, and differ from other local species. Duncker (Hamburg. wissensch. Anst., vol. 32, no. 2, 1915, p. 77) considered this character of generic importance, founding on it his genus *Micrognathus*, to which he referred *S. jonesi*, with several exotic species, though he did not deal with *S. crinigerum*.¹

¹ Since the foregoing was written, a paper by Carl L. Hubbs (Occas. Papers Mus. Zool. Univ. Mich., No. 20, 1935) has come to my attention, wherein he made *Siphostoma crinigerum* Bean and Dresel the type of a new genus, *Anachopterus*.

The color was described by Dr. Longley as dark olive green in a living animal, with a comparatively large number of faint vertical series of white spots forming crosslines at the segments of the body and tail; some of the white bars more distinct than others; three on trunk, eleven on tail, the latter not all equally distinct.

The color of preserved specimens varies from grayish to brownish, irregularly spotted with darker spots. Upper half of trunk with three and tail with eight to ten white crossbands in adults, wanting in the smaller specimens; snout with a dark lateral band, extending on cornea; two dark diverging bands behind eye, extending forward on cornea.

Body keels low, not carinate; snout shorter than postorbital part of head. The following proportions and enumerations are based on 4 specimens varying from 68 to 102 mm. in length: Head 11 to 12; depth 18 to 24; dorsal base 12 to 13. Eye in head 6.5 to 7.5; snout 3.4 to 4.0; depth 2.0 to 2.1; dorsal base 1.05 to 1.1. D. 18 to 21, on 1 + 4 or $\frac{1}{2}$ + 5 rings; rings 17 or 18 + 32 to 34; egg pouch on 18 rings in the single male at hand. Dr. Longley counted D. 18 or 19, on 1 + 4 rings; rings 17 + 32. In the 2 specimens questionably identified by Dr. Longley as *S. crinigerum*, the counts are, D. 18 and 19, on 1 + 4 rings; rings 17 + 33 and 17 + 34.

A small size seems to be attained, as a male 100 mm. long is sexually fully mature.

Bermuda to Florida and Puerto Rico.

S. F. H.

Syngnathus dunckeri Metzelaar

Syngnathus dunckeri Metzelaar, Trop. atl. Vissch., 1919, p. 28, fig. 9—Curaçao.

Corythoichthys bermudensis Beebe and Tee-Van, Zoologica, vol. 13, 1932, p. 113—Bermuda.

This species is not rare about Long Key and inside Bird Key reef.

The type of *Corythoichthys bermudensis*, with 2 others like it, has 26 caudal rings. But the caudal keels in none of the 3 are symmetrically and fully formed, and the unusual number of 8 or 9 caudal rays is present, indicating abnormality. Comparing these 3 with specimens in which the caudal keels are fully formed and which have the customary 10 caudal rays, one finds in the latter the more usual number of rings, namely, 16 or 17 + 33 or 34. Available specimens in the New York Zoological Society collection, with the type, show that the dorsal rays may vary from 23 to 25, that the fin may be on 6 to 7 caudal rings, and that the brood pouch may occupy 15 to 19 caudal rings.

A specimen 80 mm. long, standard length 77 mm., may be described as follows: Depth 4.0 mm.; tip of rostrum to anus 28 mm.; head 7.0 mm.; snout 2.25 mm.; eye 1.2 mm. Rings 17 + 32, brood pouch on 17 caudal rings; D. 23 on 0 + 6 rings. Lateral keel of trunk ending on last body ring; superior caudal keel beginning on first caudal ring, above and behind end of lateral keel of trunk; rostral keel very low, without beading; supraorbital ridges and occipital and nuchal keels exceedingly low; keels on trunk not strong; body distinctly angulate in cross section.

Color brown, with a light bar on each segment, every second to fourth more distinct; five of the broader light lines before dorsal, two under, and eight or ten behind it; a cuneiform light mark behind eye, with apex forward; eye with alternating and radiating dark and pale lines.

Breeding takes place at least in late June and July at Tortugas. W. H. L.

Three specimens, 80, 88, and 94 mm. long, are included in the collection.

The short, slightly upturned snout, contained 3.0 to 3.5 times in head; the abruptly ending lateral keel on the last body ring or on the first caudal ring, and the origin of the superior caudal keel above or slightly in advance of the end of the lateral keel; the moderately short dorsal, with 22 to 25 rays, situated over $1 + 6$ or $0 + 6$ or 7 rings; the light crossbars; the light spot behind the eye; and the radiating lines on the eye appear to characterize this species.

The Lesser Antilles, Bermuda, and southern Florida.

S. F. H.

***Syngnathus robertsi* (Jordan and Rutter)**

Siphostoma robertsi Jordan and Rutter, Proc. Acad. Nat. Sci. Philadelphia, vol. 49, 1897, p. 97—Jamaica.

Siphostoma elucens Evermann and Marsh (not of Poey), Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 108—Puerto Rico.

Syngnathus brachycephalus Jordan and Thompson (not of Poey), Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 235—Tortugas, Florida.

Corythoichthys brederi Parr, Bull. Bingham Oceanog. Coll., vol. 3, art. 4, 1930, p. 30—Cat Island, Bahamas.

Syngnathus pipulus Beebe and Tee-Van, Zoologica, vol. 13, 1932, p. 115—Bermuda.

Syngnathus elucens Longley (not of Poey), Carnegie Inst. Wash. Year Book No. 31, 1932, p. 299; No. 32, 1933, p. 294.

This pipefish was common, to the length of 150 mm., in turtle grass about Long Key and Bird Key reef. *Syngnathus floridae* and *Hippichthys brachycephalus* are its close associates. During the summer the males frequently have eggs or embryos in their brood pouches, sometimes as many as 325, which are arranged in as many as eight rows and are completely covered by the flaps of the pouch, which overlap broadly.

D. 20 to 24, on $1 + 4$, rarely on $\frac{1}{2} + 5$ rings; body and caudal rings 16 to 18 + 31 to 34, most usually $17 + 32$; brood pouch on 16 to 19 rings, usually 18 or 19. Keels well developed, and beaded; one on median line of snout, ending abruptly between anterior margins of eyes, a median keel in three sections on occiput and nape, one over each eye, one on anterior part of operculum, and one on base of pectoral. Body ridges, exclusive of the mid-ventral one, sharp and slightly rough.

The following proportions are based on 6 specimens ranging in length from 115 to 140 mm.: Head 7.5 to 7.9; distance from tip of snout to vent 2.25 to 2.4; depth 20 to 23; base of dorsal 11.3 to 12.3. Eye in head 6.5 to 8.5; snout 2.0 to 2.1; depth 2.6 to 3.1; base of dorsal 1.4 to 1.55. Eye in snout 3.6 to 3.8.

To permit comparison with the description of *S. elucens* by Poey, as which this species has passed with some students, including myself, measurements in

the form Poey adopted are given. In a large female the depth is scarcely greater than the thickness and equal to the width of $2\frac{1}{2}$ rings, instead of 3, as in *S. elucens*. The eye enters 3, not 4, times into the snout; the head $\frac{3}{3}$, instead of 3 times, into the preanal length; and the anus is midway between the tip of the rostrum and the 23d, not the 25th, caudal ring.

Scarcely two specimens are quite alike in color, the ground color varying from pale olive to dark brown; sides and back everywhere finely spotted and dusted with gray; stronger or weaker lines of gray crossing trunk and tail at intervals of 3 to 5 segments; the small accessory scutes on back and sides frequently outlined in gray, forming small diamond-shaped markings in regular series; snout faintly and irregularly barred, the markings stronger and more regular below; conjunctiva and iris marked with gray and olive; lower part of operculum with narrow white lines running downward and backward. In the male the ventral surface is marked, more conspicuously than in the female, with alternate bars of bluish gray and olive, the bluish bars sometimes being replaced by a transverse row of spots on the trunk segments.

West Indies to Florida and Bermuda.

W. H. L.

Syngnathus elucens Poey

Extensive notes are included among Dr. Longley's papers, and his collection contains 6 specimens identified as this species. Three other specimens seem to belong to it.

The relation between this species and *Syngnathus robertsi*, if the identifications are correct, is extremely close. The type of neither species is available for examination. Therefore, the identifications are based wholly on descriptions. As the description of *S. elucens* presumably was based on the type, which was 170 mm. long, and as *S. robertsi* was described from a specimen 112 mm. long, allowance must be made for age or size, and the comparison is by no means satisfactory.

Dr. Longley has pointed out some differences in the account of *S. robertsi*. From the comparison of 9 specimens identified as *S. elucens* with numerous specimens regarded as *S. robertsi*, I find that if extremes are chosen, the differences are striking, but some specimens are bothersome.

There is variation in depth, and there also is overlapping with respect to depth of body if compared with body rings. In fact, the depth in none of the specimens identified as *S. elucens* is fully equal to the length of 3 body rings, as stated in the original description. On the other hand, some specimens referred to *S. robertsi* are nearly as deep, the depth being equal to $2\frac{1}{2}$ to $2\frac{3}{4}$ body rings, and I have found no actual difference in the width of the body if compared with body rings.

The proportion of the eye to the snout is variable enough to result in a trivial difference if several specimens are measured, as is shown by the proportions given. The proportionate length of the head in preanal length seems to be at most only an average difference, and the same seems true of the position of the vent with respect to the snout and caudal segments.

Among the preserved material there is one difference in color, namely, *S.*

robertsi has pale lines on the opercle, running downward and backward, which are missing in the specimens of *S. elucens*. In general, *S. elucens* is rather paler in color and has fewer dark markings, and the pale bands at the segment of the rings on the ventral surface of the body and tail are more distinct, whereas the more widely spaced narrower white bands placed dorsally are visible in only one specimen. In all respects except the vertical pale lines on the opercles, some specimens approach each other closely.

The following enumerations and proportions are based on 5 specimens, ranging in length from 128 to 146 mm.: D. 22 or 23, on $1 + 4$ or $1\frac{1}{2} + 4\frac{1}{2}$ rings; body and caudal rings $17 + 31$ to 33; brood pouch on 17 to 19 rings. Head 7.2 to 8.2; distance from snout to vent 2.3 to 2.4; depth 22 to 24; base of dorsal 11 to 12. Eye in head 7.6 to 8.5; snout 1.8 to 2.0; depth 2.9 to 3.4; base of dorsal 1.4 to 1.7. Eye in snout 4.0 to 4.3.

If the present identification is correct, this species ranges from the Florida Keys to the West Indies. S. F. H.

Syngnathus rousseau Kaup

Specimens here listed apparently were identified either as *Syngnathus rousseau* Kaup or as *S. pelagicus* Linnaeus by Dr. Longley, who did not decide definitely to which one of the species named he would refer them. Neither do I know where they belong, if the two actually are distinct. Kaup's original description of *S. rousseau* is inadequate, but there is nothing in it inconsistent with the specimens in hand unless it be the "short marginal spine at interruption of each ring." *Syngnathus pelagicus*, as described in current works, agrees in color, but has rather too high a dorsal ray count, and the fin is placed too far back and covers too many rings (29 to 32, on $1 + 9$ rings). Two specimens of *S. pelagicus* from Genoa, in the U. S. National Museum, have the dorsal over $1\frac{1}{2} + 6$ and $0 + 7$ rings, and have 36 or 37 caudal rings.

Dr. Longley stated that this species is common in the Tortugas in floating *Sargassum*.

Dr. Longley found a male, 154 mm. long, that had 225 eggs in its brood pouch, which extended over $12\frac{1}{2}$ caudal rings. The flaps of the pouch did not overlap, but were turned in at the margin, covering the eggs. In a female, 157 mm. long, the right ovary contained 150 large eggs, 50 of a more or less intermediate size, and smaller ones. He added, "Clearly then there are several broods in one season."

The ridges on the head were described by Dr. Longley as a little stronger than in *S. floridae*, those on the dorsal surface, exclusive of the supraorbital ridges, being noticeably beaded; keels on body moderate, except the ventral one, beaded, and also somewhat stronger than in *S. floridae*; dorsal surface slightly concave; ventral little convex; lateral keel (lateral line) interrupted on last body ring, and reappearing at a little higher level, running upward from there to form the superior lateral keel of the tail.

The color is described as varying with age and sex. A female had the back finely streaked with broken pencilings, with back darker than sides, which were tawny olive; above lateral keels on sides of tail yellow; below lateral keel of trunk more yellow or orange with a silvery half-bar up to lateral keel; a dark bar

on side of snout, through eye, to opercle. Another female had five light bands before dorsal, one under dorsal, and nine behind it; dorsal fin with nine oblique dark bars, diffuse and irregular across the rays. The male differed in color in having silvery spots on the inferior lateral keel which did not extend up on the sides; also in having rather sharp dark bars of the width of light bands immediately behind them; ventral surface of trunk rather regularly banded.

The color of fresh specimens remains for the most part in the preserved material. The silvery half-bars in the female and the silvery spots along the inferior lateral keel in the male are good recognition marks, though *S. pelagicus*, according to current descriptions, has them too. The young, under about 90 to 100 mm. in length, do not have the silvery bars or spots and generally are plainer than the adults.

The following proportions and enumerations are based on 7 specimens, unless otherwise stated, ranging in length from 110 to 160 mm.: Head 6.9 to 7.6; depth 21 to 29; distance from snout to vent 2.2 to 2.4; base of dorsal 9 to 10. Eye in head 7.6 to 10 (4.0 to 5.25 in snout); snout 1.8 to 1.9; depth 3.0 to 4.25; base of dorsal 1.2 to 1.4. D. 27 to 29 (14 specimens counted), over $1\frac{1}{2}$ or $2 + 4$ or 5 rings; 16 to $18 + 32$ to 35 rings (14 specimens counted); brood pouch on $12\frac{1}{2}$ or 13 rings (5 specimens counted).

This species has been recorded from the West Indies and now presumably for the first time from the Florida Keys. S. F. H.

Syngnathus floridae (Jordan and Gilbert)

Siphostoma floridae, Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 5, 1882 (1883), p. 263—Pensacola, Florida.

Siphostoma mackayi Swain and Meek, Proc. U. S. Nat. Mus., vol. 7, 1884 (1885), p. 239—Key West, Florida.

Common in turtle grass on Long Key and Bird Key flats. May exceed 200 mm. in length. Males in June and July very often carrying eggs or young to the number of 150 or more, arranged for the most part in four rows, or in six at the widest part, and completely covered by the fleshy folds of the brood pouch, which are turned in smoothly and deeply along the line of contact.

Keels on the head moderate, the superior rostral and supraorbital smooth; a weak and smooth ridge on anterior part of opercle, two very slight ones, the lower stronger, on base of pectoral; the weak nuchal crest and the superior carinae of trunk and tail slightly beaded; minute pits on opercle in linear series, giving rise to a less evident appearance of striation than in *S. robertsi*. D. 28 to 34, usually on $1\frac{1}{2} + 6$ or $2 + 5$ rings; rings 17 to $18 + 33$ to 37; brood pouch on 13 to 16 rings, or rarely more, as in one of the types. Until the length of about 165 mm. is attained the sexes differ little in form except in the region of the brood pouch. The female, however, begins to increase in depth soon thereafter, and by the time she has attained a length of 200 mm. her greatest height equals a width of 4 instead of 2 rings in the same region.

Color commonly light gray over dorsal surface and greenish on sides, both back and sides much spotted with dashes and streaks of gray running lengthwise. On this ground are narrow light bands or rings at irregular intervals,

usually five or so before the dorsal, one under it, and five to seven behind it. The under side of belly and tail in both sexes is much speckled with light on a dark ground until about the time the female begins to change form, when the under surface of her body and the sides below the lateral keels become almost lemon yellow. On this ground two vertical streaks of white are present on each ring, and above the lateral keels are light spots less distinct than the white streaks.

W. H. L.

Many specimens are in the collection, including 1 abnormal specimen with only 14 caudal rings. I have also compared the specimens with the types of *S. floridæ* and *S. mackayi*. In the types the dorsal is over $1 + 6$ rings in *floridæ*, and over $2 + 6$ or $2 + 5$ rings in *mackayi*. In the Tortugas specimens, however, the following combinations occur: $1 + 6$, $1\frac{1}{2} + 5\frac{1}{2}$, $1\frac{1}{2} + 6$, $2 + 5$, $2 + 5\frac{1}{2}$, and $2 + 6$, indicating individual variation. The supposedly longer snout in *floridæ* apparently cannot be demonstrated by measurements. Of 15 specimens measured, the snout is contained in the head 1.6 or 1.65 times in 8, 1.7 or 1.75 times in 6, and 2.0 times in 1 specimen. In the 2 type specimens of *mackayi* the snout is contained in the head 1.75 and 1.8 times, and in a type specimen of *S. floridæ* 1.7 times.

The type specimens (2) of *S. mackayi* are large females with deep bodies. Considerable variation in the length at which the body becomes notably deeper is evident. For example, a female 180 mm. long remains slender, whereas another 165 mm. long shows a considerable increase in depth. I have not correlated this difference with other characters, and therefore assume that it is individual variation. More specimens of the proper length are needed to determine this matter definitely.

The comparatively great range in the number of dorsal rays is rather disturbing. Yet in 29 specimens counted no "break" is evident in the counts, as 3 have 27 rays, 3 have 28, 3 have 29, 3 have 30, 11 have 31, 5 have 32, and 1 has 33. In the 2 type specimens of *S. mackayi* the dorsal has 29 and 30 rays, and a type specimen of *S. floridæ* examined has 27.

In general, then, the evidence gained from this study confirms Dr. Longley's at least tentative conclusion that *S. mackayi* is a synonym of *S. floridæ*.

The following proportions and enumerations are based on 14 specimens unless otherwise stated, ranging in length from 120 to 200 mm.: Head 5.75 to 7.2; depth 22 (large female) to 30; distance from snout to vent 2.2 to 2.3; base of dorsal 7.8 to 10. Eye in head 8 to 10 (4.8 to 6.5 in snout); snout 1.65 to 2.0; depth 2.85 (large female) to 4.8; base of dorsal 1.3 to 1.5; D. 27 to 33 (29 specimens counted), on 1 to $2\frac{1}{2} + 5\frac{1}{2}$ to 6 rings; rings 17 or $18 + 34$ to 37 (16 specimens counted); brood pouch on 13 to 15 rings (8 specimens counted).

Bermuda, Florida, West Indies to Panama.

S. F. H.

Syngnathus louisianæ Günther

The collection contains 4 specimens, ranging in length from about 170 (caudal damaged) to 277 mm. Two specimens, a male and a female, respectively 200 and

185 mm. long, are commented upon by Dr. Longley as follows: "Believed to have come from floating *Sargassum*. In the female a keel on dorsal surface of snout from tip to level of posterior nostril, where it bifurcates and continues into the interorbital space, finely serrate throughout its length. In the male the keel is simple throughout its length from tip of snout to interorbital space, and is serrated only from the anterior end to nostrils. Supraorbital keels similarly serrulate and converge posteriorly on crown. A very slight unserrated keel upon the opercle, with ventral and posterior radiating striae. A nuchal serrated keel. Rings in female $20 + 36$; D. 34, on $3 + 5$ rings. Rings in male $19 + 37$; D. 37, on $4 + 5$ rings; brood pouch on 19 rings."

Two additional specimens, one of them a very large male, 277 mm. long, have the following proportions and counts: Head 7.7 to 8.5; depth 27 to 32; base of dorsal 8.5 to 9.2. Eye in head 8.6 to 9.1; snout 1.7 to 1.8; depth 3.7 to 4.5; base of dorsal 1.0 to 1.2. D. 33, 34, on $2\frac{1}{2} + 5$, $3\frac{1}{2} + 4$ rings; rings $20 + 33$, $22 + 34$; brood pouch on 17 rings.

This species of the South Atlantic and Gulf coasts is now recorded from Tortugas for the first time. S. F. H.

Hippocampus punctulatus Guichenot

Hippocampus punctulatus Guichenot, in Ramon de la Sagra, Hist. Île Cuba, Poiss., 1853, p. 239, pl. 5, fig. 2—Cuba.

Hippocampus styliifer Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 5, 1882 (1883), p. 265—Snapper Banks off Pensacola, Florida.

Hippocampus hudsonius Jordan and Thompson, Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 235.

Hippocampus brunneus Bean, Proc. Biol. Soc. Washington, vol. 19, 1906, p. 32—Long Bird Island, Bermuda.

Hippocampus kincaidi Townsend and Barbour, Bull. New York Zool. Soc., vol. 23, 1906, p. 304, with fig.—Bermuda.

Hippocampus hudsonius punctulatus Ginsburg, Proc. U. S. Nat. Mus., vol. 83, 1937, p. 561, figs. 63, 64.

The synonymy as given is mostly from Dr. Longley's report in *Carnegie Institution of Washington Year Book* No. 32, 1933, page 293. With much of it Ginsburg, who recently revised the genus (see citation above), is in agreement. Ginsburg, however, recognized *punctulatus* as only a subspecies of *hudsonius*. He similarly recognized *kincaidi*, but considers *brunneus* synonymous with *kincaidi*.

The 32 specimens in the collection all appear to be *Hippocampus punctulatus*, according to Dr. Longley, or *H. hudsonius punctulatus* according to Ginsburg. Much individual variation with respect to depth of body, prominence of tubercles, presence or absence and length of fleshy filaments, and color is evident. According to Ginsburg this subspecies in general is rather deeper, has a rather longer snout, and has more numerous white dots than the other subspecies, *hudsonius* and *kincaidi*.

Dr. Longley mentioned 21 catches in his notes, indicating that the sea horse is fairly common at Tortugas. Specimens were taken in turtle grass and with an

otter trawl in shallow water, some of the hauls being listed as "weedy" ones.

Color of fresh specimens from turtle grass gray, the lighter ones marbled with dark shades; body profusely speckled with fine white dots, least numerous on trunk, and in many radiating series around eye.

In the stomach of a remora, *Echeneis naucrates*, 73.5 cm. long were 20 sea horses which are much spinier than *H. punctulatus*, probably *styliifer* (see synonymy above). Specimens very dark brown, barred with white on tail, slightly and irregularly mottled with white elsewhere; skin near eye with radiating light lines; narrow radiating light lines on iris. D. 19, on about 2 + 2 rings.

Concerning another lot Dr. Longley noted that the specimens were very "weedy," and the dermal processes very long and repeatedly branched; that the shade was variable, the white outlined in white, and the blotches much subdivided; bars across iris as wide as pupil; 3 specimens each with D. 19.

Among 3 specimens taken in the southwest channel on August 1, 1931 was a male, 145 mm. long from coronet to tip of tail, with eggs. Ground color dark brick red, with a few irregular white marks on head, including radiating white lines of white dots about the eye, and a few white punctulations on posterior half of body and tail. Dorsal with a yellow margin and a black submarginal band as wide as pupil. No cirri except a few small ones under snout. D. 20, on 2 + 2 rings; P. 17; rings 11 + 37.

These and other data in Dr. Longley's notes show that much variation in color, height of spines, and development of cirri exists among individuals.

According to Ginsburg (see citation above), this sea horse is of southern distribution, ranging at least from Florida to Cuba. S. F. H.

Family AULOSTOMIDAE. TRUMPET FISHES

Aulostomus maculatus Valenciennes

(Plate 1, figures 1, 2)

Two large specimens were found among gorgonians, beside the vertical branches of which they commonly rested head downward. In one of these a banded pattern replaced the more usual one of stripes or self color. Bands, however, were not shown by the other. The general shade is variable, being noticeably lighter over bare bottom than elsewhere.

A specimen of 125 mm., taken in turtle grass, was olivaceous in coloration dorsally and ventrally, distinctly countershaded. It had three main dark stripes, dorsal, lateral, and ventral, running from snout to caudal, separated by very narrow light lines. The body was crossed by many faint vertical light lines, producing a pattern of about ten broad dark bars before the eye, fifteen between eye and dorsal fin, and ten from origin of dorsal to caudal. The dorsal and anal fins each had one dark line parallel to the base, and the caudal fin was dusky with clear angles. W. H. L.

A preserved specimen, about 330 mm. long, has the color essentially as in the specimen described by Dr. Longley. It also has rather distinct round black spots

within the dark stripes that unite anteriorly and pass through the eye as one stripe. The snout has light spots laterally, some of which are elongate and oblique; and the broad maxillary has a black longitudinal stripe.

The body is elongate, compressed, and decidedly more robust than in *Fistularia*. Prolonged snout heavier and proportionately shorter, 1.47 in head; a small slender barbel, not quite as long as eye, at chin; D. X-24, spines separate; A. 26; P. 14; V. 6; caudal somewhat pointed, without filament; scales small, strongly ctenoid, in about 215 oblique series above lateral line.

Caribbean Sea to southern Florida.

S. F. H.

Family FISTULARIDAE. CORNET FISHES

Fistularia tabacaria Linnaeus

Young fish of this species were occasionally taken at Tortugas.

The largest one available is 388 mm. in length; 266 mm. to base of caudal; caudal filament 112 mm.; greatest depth 8.0 mm.; greatest breadth 14 mm.; head 102 mm.; eye 11 mm.; interorbital width 4.0 mm.; postorbital length of head 22 mm. D. 18; A. 17; anterior rays in each very short, probably not all included in published record, which gives D. 14; A. 13. Lateral-line pores 100, the line protected by as many ossicles, of which the last 40 project visibly as so many scutes; posterior third of body with "minute asperities," with projecting spinules.

A single specimen, perhaps 200 mm. long, filament included, floating above a sparse growth of *Thalassia*, was greenish, crossed by a number of light lines. In larger ones the body, including snout, was crossed by brownish olive bands; a median, a dorsolateral, and a ventrolateral bluish line with lighter spots present; each darker bar, between the spots of blue, with longitudinal dashes darker than the ground color.

W. H. L.

A specimen of cornet fish was recorded from Tortugas by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 235) as *Fistularia serrata* Cuvier. That a second species of cornet fish actually exists at Tortugas cannot now be confirmed.

Caribbean Sea to Florida and sometimes northward.

S. F. H.

Family MACRORHAMPHOSIDAE. SNIPEFISHES

Macrorhamphosus scolopax (Linnaeus)

Three specimens 100 to 120 mm. in length were taken in one haul with the otter trawl between 110 and 150 fathoms. These fish were red when fresh.

The foregoing note is all I can find on this species among Dr. Longley's data. The specimens do not seem to be included in the collection.

Fowler (Proc. Acad. Nat. Sci. Philadelphia, vol. 86, 1934, p. 353, with figs. 1, 2 on p. 355) has shown that a specimen taken off Cape May, New Jersey, differed from European ones in having a notably deeper body (depth about 3.66 in the American specimen, 4.5 to 6 in European ones), and in the more advanced

position of the spinous dorsal, which has its origin well in advance of the anal in the American specimen, instead of over or slightly behind the origin of the anal as in European ones. This last character was checked in 5 specimens taken off Key West, Florida (U. S. Nat. Mus. nos. 73103, 73104, 73106), and found to agree with Fowler's specimen.

On the basis of the differences discovered, Fowler named his specimen *Macrorhamphosus otteri*. It seems highly probable that Dr. Longley's material should have been referred to this recently described species, especially as specimens from the vicinity of Key West apparently are of that species.

Both sides of the Atlantic, if identification given herein is accepted. S. F. H.

Family ATHERINIDAE. SILVERSIDES

Hepsetia stipes (Müller and Troschel). HARDHEAD

Common along shore during the summer, but decreasing in abundance as the season advances. With males, at least, in full breeding condition, with sperm streaming from urogenital papillae upon the least pressure, the sexes occur together in sizes varying not less than from 63 to 90 mm.

A dark transverse line between anal and excretory openings marks the genital orifice, which may be forcibly opened by slight abdominal compression. In all of many specimens examined the eggs were of many sizes, and showed no tendency to mature at once. From an early stage of development the chorion is sparsely covered by 75 or more long filaments swollen at the base. Until the egg is well grown they lie close against its surface. In length they may exceed considerably the egg's diameter, and they form efficient holdfasts.¹

The schooling hardheads are sometimes attacked by needlefish or gray snappers and by passing schools of runners. The hardheads' own food is highly varied. The fish are apparently nocturnal feeders. The pellets they drop if held in confinement sometimes contain very many copepods, carapaces of crustaceans larger than copepods, or cuticula, setae, and jaws of annelids, and one contained the shells of small gastropods. Miscellaneous crustaceans and crustacean larvae, lamellibranchs and molluscan larvae, and foraminifera were also present.

In design this species shows a feature common to many surface fishes, the head being approximately triangular in cross section, with eyes looking down and out, scarcely visible from above, both fully visible from below. The fish is greenish above, with a narrow line of darker green from opercular margin to base of caudal; rest of the side, including the iris, silvery. W. H. L.

This species is characterized by its short, thick body (depth 4.6 to 5.2 in standard length); low, broad head, as wide as deep; short, blunt snout (4.2 to 4.7 in head); and large scales (36 to 39 in lateral series). D. IV or V-8 to 10; A. 12 or 13.

West Indies to Florida.

S. F. H.

¹ For information concerning adhesive filaments attached to the eggs of other species of Atherinidae, see Kuntz and Radcliffe (Bull. U. S. Bur. Fish., vol. 35, 1915-1916 (1917), pp. 127-130), and Hildebrand (*ibid.*, vol. 38, 1921-1922 (1922), pp. 113-120).—S. F. H.

Family MUGILIDAE. MULLET

Mugil curema Cuvier and Valenciennes

Not common. A school of two dozen of much the same size, up to 350 mm., were seen at the Laboratory dock; a smaller number with several score of young of different sizes in the moat at Fort Jefferson; and others in brackish landlocked pools on Long Key.

D. IV-9½; A. III,9½; dorsal and anal scaly; scales about 38; pectoral failing by one-third its own length to reach dorsal.

A 65-mm. fish was ashen or slaty over the slate bottom of an aquarium, but gray only over sand in a tank and elsewhere. W. H. L.

Young mullets, under about 50 mm. in length, have only 2 anal spines, whereas adults always have 3. Furthermore, the color of the young is bright silvery. Because of these differences the young were not associated with the adults for a long time, and were thought to belong to a distinct genus and species. It seems probable that *Querimana gyrans* recorded from Tortugas, under this misapprehension, by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 235) were the young of this species.

This mullet is numerous at Key West, where it is of some commercial importance.

Widely distributed on both coasts of the Americas.

S. F. H.

Mugil cephalus Linnaeus

Dr. Longley apparently did not take this species. Jordan and Thompson, however (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 235), stated, "Fairly common in the winter months, at times congregating in uncountable numbers on the shoal north of Garden Key, where they spend hours swimming around a huge vortex."

This species is distinguished from *Mugil curema* by the fewer anal rays, the adults having only 8 soft rays, whereas those of *M. curema* have 9. Furthermore, the second dorsal and anal have few or no scales, whereas in the adults of *M. curema* these fins are densely covered with scales. *M. cephalus* usually has rather definite dark stripes along the rows of scales, which are missing in *M. curema*.

Cosmopolitan in distribution.

S. F. H.

Family SPHYRAENIDAE. BARRACUDAS

Sphyraena barracuda (Walbaum). GREAT BARRACUDA

(Plate 2, figure 2)

This sea wolf occurs wherever other fishes gather, whether at the shore or about the reefs, banks, or bars. The larger ones, 3 to 5 feet in length, were commonly seen singly, but as many as a dozen or even 20 smaller ones sometimes were seen together, and once about a thousand young up to 150 mm. in length were observed in one school.

The food of the barracuda consists chiefly of fishes, although squids occasionally are taken. Large fish are cut into great lumps of several pounds' weight by the shearing palatine teeth before being swallowed. This barracuda was commonly seen lying near schooling fishes, which warily avoided it and seemed usually to escape its sudden dashes. It is readily caught by trolling.

The color is changeable in high degree. The young from one to several inches in length have a lateral dark stripe. The larger fish show a banded pattern that appears also in the young, as well as a plain one, countershaded and marked only by a number of black spots along the lateral line.

The plain pattern is that in which the fish usually swims or rests high above the bottom. In this phase the green above passes gradually to silver on the side, and this more abruptly to plain white upon the belly. In this phase the fish is readily seen from above, but if viewed at even a short distance by a diver working at its own or lower level it seems gray, and is readily lost in the blue-gray haze of the water. In the banded phase the body is crossed by seven distinct bars. This pattern is displayed when the fish rests over dark or variegated bottom. For example, of two 375-mm. fish seen at once at a dock at Fort Jefferson, one lay in the shadow of a cluster of piles, and the other was in bright sunlight over light-colored sand. The first was dark and conspicuously banded; the second, pale and uniform in coloration except for its countershading. Another observation was made upon a group of young barracudas, about 125 mm. long, at the Laboratory dock. Some were over light-colored sandy bottom, and were light and uniform in color. Others were over bottom littered with brown algae, black sea-urchin spines, and dark-colored waste, and these were darker and plainly banded.

W. H. L.

Gudger has written an extensive account entitled "*Sphyræna barracuda*; its morphology, habits, and history" (Carnegie Inst. Wash. Pub. 252, 1918, pp. 53-108, 5 figs, 7 pls.), in which he discusses, among other matters, the ferocity of this fish. That it will attack man occasionally is a well-established fact.

West Indies, Brazil, and northward on the Atlantic coast of the United States.

S. F. H.

Sphyræna picudilla Poey

Not rare. One specimen, 150 mm. long, had the body scarcely compressed; pectorals not reaching ventrals; 132 to 134 scales with pores; 17 in series keeled, these chiefly on caudal peduncle.

Color olivaceous above, silvery on sides and belly; a median dark stripe from interorbital space to insertion of second dorsal; paired dorsolateral and ocular stripes from snout to caudal, the former tangent to the eye above and reaching upper margin of caudal base, the latter passing through pupil; both paired dark lines, especially the ocular, breaking up to form spots on trunk. W. H. L.

This barracuda, besides being smaller, is distinguished from the greater one by the position of the ventral fins, which are inserted under the origin of the spinous dorsal in the smaller one and well in advance of that fin in the greater

one. Furthermore, the scales are much smaller in the smaller species, which has about 123 to 134 in a lateral series, whereas the larger one has only about 79 to 85. West Indies to Brazil and Florida. S. F. H.

Family SCOMBRIDAE. MACKERELS; TUNAS

Scomberomorus regalis (Bloch)

A single specimen was seen in shallow water, where it is apparently rare in summer. Numbers were caught while trolling outside the lagoon. W. H. L.

This fish is not numerous at Key West during the summer, but it is abundant enough there during the winter to be a food fish of importance. A similar seasonal range in abundance may prevail at Tortugas, where the investigations were not carried through the winter.

It is rather close to *Scomberomorus maculatus*. Presumably it grows somewhat larger, as a maximum weight of 35 pounds is reported. Adults may be distinguished by the small scales on the pectoral fins, by the dark longitudinal line or lines on the side, and by the black on the anterior part of the spinous dorsal, which does not involve the base of the fin.

Massachusetts to Brazil.

S. F. H.

Scomberomorus maculatus (Mitchill). SPANISH MACKEREL

Taken occasionally in summer trolling. Several young, 33 to 35 mm. long, dipped up under a light at boat's side at night are believed to be this species. Three had fin rays as follows: D. XIX-24 to 26; A. II,25; for what are eventually to be free finlets (9 in the dorsal and 8 in the anal) are at this stage of development merely rays stronger than the others, and still united by membrane.

Body slightly pigmented above; the rest silvery. A black spot covering the first three dorsal webs. W. H. L.

This species is abundant in the vicinity of Key West only from about November to April, when large quantities are marketed. This seasonal change in abundance probably extends to Tortugas.

This is the smallest of the three local species of the genus, rarely exceeding 20 pounds. Adults have roundish yellow spots on the upper part of the sides, and the spinous dorsal anteriorly (involving about 3 to 6 spines) is black to the base. There are no scales on the pectoral fins as in *Scomberomorus regalis*.

Middle Atlantic states to Brazil, also on the Pacific coast of tropical America. S. F. H.

Scomberomorus cavalla (Cuvier). KINGFISH

Not common in summer. Only 2 seen off the Laboratory wharf. W. H. L.

Gudger (Carnegie Inst. Wash. Pub. 391, 1929, p. 164) reported a single specimen from Tortugas, 652 mm. long, caught by trolling. Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 237) stated, "Often taken by

trolling in the deep water southeast of Loggerhead Key." This species, like the others of the genus, is abundant at Key West only during the winter. A similar seasonal abundance probably prevails at Tortugas.

This fish reaches a weight as great as 75 pounds. Aside from the larger size attained, it differs from the other local species of the genus in the more posterior position of the anal, which has its origin well behind that of the dorsal, whereas in the other two species its origin is directly under that of the dorsal. Furthermore, in this fish the lateral line is abruptly decurved under the second dorsal, instead of being gently decurved as in the other species.

Cape Cod to Brazil; also Africa.

S. F. H.

Euthynnus alletteratus (Rafinesque). LITTLE TUNNY

Common and taken from time to time by trolling. Measurements of one specimen were as follows: Total length 740 mm.; to base of caudal 655 mm.; depth 170 mm.; head 165 mm.; eye 28 mm.; pectoral 112 mm., extending nearly to vertical of 11th dorsal spine; dorsal origin above middle of pectoral base and over ventral origin; D. XVI,12 (or XV-I,12)-IX; A. 15-VII; teeth on palatines 10 or 12, in single series, relatively weaker in adult than in young; gill rakers 28.

The young to the length of about 150 mm. are caught rather commonly by noddy and sooty terns, and collections of waste from their rookeries usually include fragments, readily recognizable by the peculiar structure of the backbone. This is composed of 39 vertebrae, and in the subvertebral trellis, which supports the hemapophyses, are 14 closed loculi under vertebrae 17 to 31 inclusive.

The stomach of a single specimen contained 4 halfbeaks, *Hemiramphus*, each about 125 mm. long; 1 needlefish, *Strongylura raphidoma*, about 150 mm. long; and the bones of another.

The spinous dorsal, though high and strong anteriorly, is depressible in a groove; the pectoral fins, strong and rigid when outstretched, at rest are received in triangular depressions; the ventral fins at rest, too, fit in shallow depressions; and about the jaws and opercular elements no free border projects by a hair's breadth to mar the smoothness of contour and to hinder swift swimming.

The body is countershaded from dark blue above through lustrous silver to flat white upon the belly. On the posterior half of the body above the lateral line is a ripple pattern in darker shades. The pectoral on its posterior surface is deep blue like the back, on its anterior surface full silver; the ventrals are also blue on their horizontal upper face but flat white below; and on side below pectoral in re-entrant angle of corselet are several round dark spots half size of pupil.

Warm seas, northward to the middle Atlantic states.

W. H. L.

Family GEMPYLIDAE. SNAKE MACKERELS

Gempylus serpens Cuvier and Valenciennes

I have had this fish at Tortugas only in the collection of scraps from the Bird Key tern colony, whence pieces of 4 were obtained in poor condition. To deter-

mine the fin formulas in detail was not possible, but the long spinous dorsal, elevated lobes of dorsal and anal, and number of soft rays, together with the well developed, widely forked caudal fin, marked the species rather well.

W. H. L.

The fin formulas as given in a published account are, D. XXX or XXXI,₁₂ or 13-VI; A. III,₁₂-VI. Body very elongate, depth contained about 15 to 17 times in standard length; head about 5 to 5.5; scales missing; ventrals reduced to a pair of very small spines.

This species, as understood by most ichthyologists, occurs in various parts of the Atlantic. It has generally been assumed that it inhabited deep water, but the occurrence of the young in the waste of the bird rookery indicates that at least part of the time the fish must be pelagic.

S. F. H.

Family TRICHURIDAE. CUTLASS FISHES

Benthodesmus atlanticus Goode and Bean

Two specimens, 475 and 530 mm. long, are included in the collection. The smaller one was taken in 205 to 283 fathoms, and the larger one in about 250 fathoms.

The specimens, which are not in very good condition, were identified as *Benthodesmus atlanticus* by Dr. Longley, which probably is correct, though the fin-ray counts are lower than those given in the original description. It is difficult to find the beginning of the anal in the specimens at hand, and that enumeration may not be accurate, though the one for the dorsal should be correct. As the type was taken from the stomach of a halibut, it probably was not in good condition, and the counts based on it may not be very accurate. Dr. Longley counted 126 rays in the dorsal and 76 in the anal in the smaller specimen, and the larger one according to my enumeration has 115 rays in the dorsal and about 70 in the anal. As the counts given for the type are 154 for the dorsal and 100 for the anal, it is necessary to make considerable allowance for errors and for variation to identify the specimens in hand with the type.

Caudal fin damaged in Tortugas specimens; peduncle very slender; head rather broad and flat above, with a slight bony ridge at nape; lower jaw projecting strongly; mouth rather larger and jaws stronger than in the cutlass fish, *Trichiurus lepturus*; teeth in anterior part of upper jaw very large, fanglike, the lateral ones and those of the lower jaw smaller, yet fairly large; gill rakers small, with minute points between the somewhat larger ones, about 5 + 7 of the larger ones on first arch.

The color of preserved specimens is silvery.

The following proportions are based on the 2 specimens in the Tortugas collection: Head 6.8, 7.1; depth in head 3.5, 3.4; snout (to tip of upper jaw) 2.4, 2.5; eye 6.75, 6.9.

Deep water of the Atlantic.

S. F. H.

Family ISTIOPHORIDAE. SAILFISHES

Istiophorus sp.

One juvenile sailfish, 9 mm. long, taken off West Buoy, June 6, 1929, is included in the collection.

This specimen agrees well with Lütken's illustration (*Spolia atlantica*, 1880, p. 441, pl. II, fig. 11). Both jaws somewhat produced, upper scarcely longer than lower; mouth very large, slightly oblique, provided with rather large teeth; angle of preopercle with a very large spine, about as long as the part of the head anterior to it; another spine at shoulder, about half as long, being a continuation of a ridge extending backward from over the eye; dorsal fin low and single, the rays not sufficiently developed to be counted; caudal fin slightly damaged, but apparently round.

Color above very dark, somewhat paler underneath, the caudal peduncle becoming abruptly pale just before base of caudal; fins all colorless.

The specimen is too immature to attempt a specific identification, especially in view of the comparatively recent effort to recognize three species of sailfishes in the Florida fauna.

S. F. H.

Family CORYPHAENIDAE. DOLPHINS

Coryphaena hippurus Linnaeus

These fish are rarely seen in the shallows, for they live chiefly outside. Four large ones were seen, however, within the lagoon, and Thompson (Jordan and Thompson, Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 238) collected the young from floating *Sargassum* inshore.

Dolphins are enemies of flying fishes, which they flush like quail, and sometimes follow and catch as they fall after a fumbling start or full flight. Young dolphins suffer greatly from the attack of terns, and are easily one of the six species most commonly collected on the Bird Key breeding ground.

W. H. L.

The dolphin is recognized by its elongate, compressed body, highest at nape, especially in adult males; by its small cycloid scales; and by its long dorsal and anal fins, the former beginning over the nape and being composed of about 55 to 60 rays (no definite spines), the latter shorter with about 25 to 30 rays.

Reported from both sides of the Atlantic and also from the western Pacific.

S. F. H.

Family NOMEIDAE. MAN-OF-WAR FISHES

Nomeus gronovii (Gmelin)

Pelagic; commonly associated with the Portuguese man-of-war, beneath each of which several may usually be found.

Paris blue above, solid or in patches; this color continued ventrally in bands or blotches, through which gleaming silver shimmers; a bar of blue across each caudal lobe at base, and spots of blue at base of anal, extending upon its web;

dorsal fins bluish; pectorals also bluish basally or throughout their dorsal two-thirds; blue, in diffuse lines, following the rays of the great ventrals and spreading over their posterior margins; eye blue above, with a pigmented sector unexposed in its normal position; iris silvery, crossed by an oblique line extending to angle of mouth.

W. H. L.

This fish is characterized by its oblong compressed body; depth in standard length 3.0 to 3.8; D. IX to XI-I, 25 to 27; A. III, 25 to 27; ventrals much larger than pectorals in young, becoming proportionately shorter with age, fan-shaped, and inserted under base of pectorals.

Widely distributed, straying northward to Cape Cod.

S. F. H.

***Psenes cyanophrys* Cuvier and Valenciennes**

Observed only in collections of fishes dropped by terns in their rookery on Bird Key. Nearly 150, up to 120 mm. in length, were picked up at different times. Twice 2 were adhering to one another, having been regurgitated together. One each was found similarly with *Monacanthus hispidus* and *Trachiurops crumenophthalma*, and 2 with *Caranx ruber*. The combination indicates a pelagic fish, possibly occurring about the *Sargassum*, where young *M. hispidus* is common.

D. X-I, 25½; A. III, 27. Color, as far as determinable, brownish yellow, with longitudinal rows of brown dots on side; caudal yellow.

W. H. L.

This species differs strikingly from the preceding one in having much smaller ventral fins, which are not larger than the pectorals. Furthermore, the body is deeper, the depth generally being contained in the length less than 2.0 times.

Widely distributed in tropical seas, straying northward at least to Florida.

S. F. H.

Family CARANGIDAE. POMPANOS, ETC.

***Decapterus punctatus* (Agassiz)**

These fish were taken about a submerged light at night, and also in water 11 to 22 fathoms deep.

In life over bare bottom they did not show the greens and yellows of the dead fish. Instead, they were faintly gray, countershaded, silvery below, with a narrow brown or black line of width of pupil from snout to caudal. The stomachs of specimens examined contained copepods.

Fifteen to 20 specimens, about 90 to 100 mm. long, were picked up among the refuse of the Bird Key rookery.

W. H. L.

The elongate, roundish body, with depth 4.3 to 5.3 in standard length, the very prominent scutes in the straight part of the lateral line, and a single detached finlet following both dorsal and anal characterize the species. The fin formulas are: D. VII or VIII-29 to 31-1; A. II-I, 25 to 27-1. Lateral scutes 35 to 42; gill rakers about 35.

Atlantic coast of tropical America, sometimes northward to Cape Cod.

S. F. H.

Trachurops crumenophthalma (Bloch)

The young, 65 to 210 mm. long, were common in the refuse of the rookery on Bird Key. The adults largely escaped observation, but were seen occasionally in shallow water. Four taken in a gill net at Garden Key, June 29, 1929, included males and females in breeding condition, the largest 270 mm. long.

A specimen 120 mm. long showed a well defined lateral stripe of yellow, running from margin of opercular to middle of base of caudal. In larger fish there were indications of the same stripe.

The stomach of one contained a large shrimp and a partly digested fish, probably a *Harengula*.
W. H. L.

This fish is characterized by the elongate, little-compressed body; the very large eye, about 2.75 to 3.2 in head; the peculiar deep furrow in the shoulder girdle at its juncture with the isthmus, with a fleshy projection above it; and the large, oblique mouth, with projecting lower jaw. D. VIII-I, 23 to 26; A. II-I, 20 to 23.

Atlantic coast of the United States to Brazil; also Africa.

S. F. H.

Chloroscombrus chrysurus (Linnaeus)

Four specimens 10 to 17 mm. in length were found swimming with the jelly-fish *Aurelia*. D. VIII-I, 26 to 28; A. II-I, 26 or 27.
W. H. L.

The rather large number of fin rays, the strongly rounded ventral profile in contrast with the much less strongly convex dorsal one, the deeply forked caudal, and the numerous close-set gill rakers (about 28 to 33) distinguish this species.

Atlantic coast of tropical America, straying northward to Cape Cod.

S. F. H.

Seriola dumerili (Risso). AMBER JACK

Caranx dumerili Risso, Ichthyol. Nice, 1810, p. 175, pl. 6, fig. 20—Nice.

Seriola dumerili Risso, Hist. nat. poiss., vol. 3, 1827, p. 424. Meek and Hildebrand, Field Mus. Nat. Hist., Zool. Ser., vol. 15, pt. 2, 1925, p. 397.

Seriola lalandi Cuvier and Valenciennes, Hist. nat. poiss., vol. 9, 1833, p. 208—Brazil.

Seriola fasciata Jordan and Thompson, Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 237.

With *Seriola* my acquaintance is slight. It is possible that my observations refer to more than one species. I note, however, that large individuals mentioned below display in combination characteristics which have been said to distinguish *S. dumerili* and *S. lalandi*, and follow Meek and Hildebrand (see citation above) in uniting the two.

Two specimens 785 and 880 mm. long, taken by trolling between Loggerhead and Bird keys, measured respectively 610 and 690 mm. to base of caudal. Depth in each 3.4, and head 3.3; D. VII-I, 32½; A. II-I, 20½; and D. VII-I, 36½; A. II-I, 21½. Each with a broad diffuse streak of yellow from snout through eye to base of caudal, and a more indistinct and incomplete one from eye toward origin of dorsal.

Fish that I believe to be the young of this species accompany floating *Sargassum*. At 115 mm. their color is olivaceous above, golden below; a line of dark brown of width of pupil extending through eye from snout to dorsal origin; body with six crossbands of about the width of the paler interspaces; a yellow line above pectoral base and extending to base of caudal represents the brassy stripe of the adult.

Fragments of fish, of a length of 100 mm. or a little more, have not been rare in the refuse of the tern colony on Bird Key, and its successor on Long Key.

W. H. L.

This fish, which reaches a weight of about 100 pounds, is most readily recognized by its elongate body, depth about 3.4 in standard length; by the low anterior lobes of the soft dorsal and anal, which are scarcely elevated except in large examples; and by the small number of gill rakers (10 to 14 on lower limb of first arch).

Middle Atlantic states to Brazil, also Mediterranean Sea.

S. F. H.

***Caranx ruber* (Bloch). RUNNER**

(Plate 2, figure 3)

A fish of the open water, swift and restless. At Tortugas the commonest of the carangids in summer. Schools of small or medium-sized ones may then be found over any bottom, but large adults are comparatively rare.

Small ones are taken by the terns in great numbers, several hundred, up to 215 mm. in length, having been gathered in the Bird Key rookery.

This species is a terror to smaller fishes. Young or small scarids and labrids fly from its approach. Schools of the lesser surface fishes, madly dashing and leaping, may often be seen between the upper and nether millstones of its and the terns' attack.

As seen by the diver, it is usually bluish gray, with a median dark blue or black line from the nape becoming visible laterally in advance of the soft dorsal and continuing at its base to the caudal peduncle and thence to the tip of the lower lobe of the fin; a light blue line of half its width runs above it throughout its length. But this pattern is changeable. By day the fish may be more ashen or even slaty in hue. At dusk over clear sand the darker blue stripe may fade out completely.

In contrast with its usual haste is its leisurely approach where *Thalassoma* or *Anisotremus* waits to ease, it seems, each parasite-infested passer-by of its unrest. In slow circles the wheeling school revolves, while here and there individuals with premaxillaries protruded and perhaps with gill covers raised solicit attention. Those that do not receive attention resume their swimming, and offer themselves again while the group remains or after it makes a brief excursion, vanishes in the gray haze, and returns to gyrate anew. While undergoing inspection the fish wriggle and at last break away and rejoin their fellows, but on the whole seem pleasurably embarrassed by the treatment they received.

W. H. L.

The numerous gill rakers, the long dorsal and anal, and the color characterize this species. The following counts are from Dr. Longley's notes: D. VII or VIII-1,27 or 28; A. II-I,24 or 25; gill rakers 32 to 34.

West Indies, northward on the southern shores of the United States.

S. F. H.

***Caranx bartholomaei* Cuvier and Valenciennes. YELLOW JACK**

During the summer this species was seen more commonly than any other carangid except *Caranx ruber*. It is rather more a bottom fish than that species, and less shy. A dozen or more almost in single file sometimes were seen swimming only 6 to 8 inches from the bottom while small fishes scurried from their line of march.

Particularly after death this fish has a yellowish cast to which it owes its name; fins chiefly yellow; dorsal rising from within a median yellow stripe; sides crossed by five faint blue and wavy transverse lines giving it a pattern something like that of watered silk. The young at 165 mm. with a vertical dark line of width of pupil passing through eye; five or six narrow bluish lines, strongly inclined forward and downward, visible above lateral line, and oblong silver spots on a yellow ground below it.

A few, up to 185 mm. in length, were collected in the Bird Key rookery.

This species is readily distinguishable by the depth, which is considerably greater than that of *C. crysos* and *C. ruber*; by the rather small number of gill rakers; and by the smaller number of anal rays, about 2 less than in *C. ruber*.

West Indies, northward to the southern shores of the United States.

W. H. L.

***Caranx lugubris* Poey**

A single specimen, about 80 mm. long, obtained in waste from the tern colony on Long Key. At this size it is very unlike species of *Caranx* locally common. It is distinguished, in part, by its larger head; shorter snout; stronger teeth; one strong median tooth on vomer; none visible on palatines; scutes much stronger than in other local species; and spines of posterior half of series strongly antrorse.

In color it is almost uniformly leaden, except that the pectoral and caudal fins are sharply dark at the base only, and the rest seems to have been yellowish.

Tropical Atlantic, northward to Florida.

W. H. L.

***Caranx latus* Agassiz**

Occasionally large schools gather about the Laboratory and east lighthouse dock; the young, 50 to 125 mm. in length, are not uncommon during the summer; and the smaller sizes are common in the waste from the Bird Key rookery.

This fish is changeable in color. The young often, and the half-grown occasionally, are banded with an oblique dark line as wide as pupil, running from occiput through eye nearly to angle of mouth; body barred with alternate dark and light vertical bands, of approximately equal width in the young, but with the dark bars broader in the larger individuals. In the adult fish, as seen in the water, the color commonly is blue-gray, countershaded to silver below, self-

colored except for a dark spot at the upper angle of the opercular cleft, the dark tip of the falcate dorsal fin, and the yellow caudal. W. H. L.

Aside from color, this species is recognizable by the very moderately elevated anterior lobes of the second dorsal and the anal; the somewhat enlarged teeth on the lower jaw; and the low number of gill rakers, 14 or 15 on the lower limb of the first arch. Other enumerations and proportions are: D. VIII-I, 20 to 22; A. II-I, 17 or 18; lateral scutes 35 to 38. Head 2.9 to 3.2; depth 2.5 to 2.6 (enumerations and proportions based on 3 specimens in the Tortugas collections, 95, 111, and 140 mm. long).

Tropical Atlantic, northward on the coast of the United States to or beyond Virginia. S. F. H.

***Caranx crysos* (Mitchill). HARDTAIL**

The young are apparently common about the Tortugas, though taken rarely by us. Only a few adults were noticed. Some may have been mistaken, however, for *Caranx ruber*, with which they may school. In collections of refuse from the tern rookery, to the length of about 100 mm., they were less numerous than the two common flying fishes, *Parexocoetus mesogaster* and *Cypselurus furcatus*, and the filefish, *Monacanthus hispidus*. Usually *Caranx ruber* was better represented, and often one or all of the following were more numerous: *Psenes cyanophrys*, *Coryphaena hippurus*, and *Trachurops crumenophthalma*.

The many scutes of the lateral line identify this fish readily in the rookery waste, even when, having been swallowed headforemost, the anterior half of the body is largely digested. The opercular spot, more falcate second dorsal, rounder snout, and absence of a definite dark dorsal stripe continuing into the lower lobe of the caudal fin distinguish it further. It is not more yellow than *C. ruber*, except when quite young.

A large specimen, 550 mm. in total length, was 430 mm. long to base of caudal; depth 140 mm.; head 115 mm.; eye 22 mm.; straight portion of lateral line 180 mm. D. VIII-I, 23; A. II, 21; gill rakers on lower limb of first arch 25; lateral-line scutes with spines, about 40.

Tropical Atlantic, straying northward to Cape Cod.

W. H. L.

***Caranx hippos* (Linnaeus)**

No mention of this species was found in Dr. Longley's notes, indicating he did not take it. The only record of its capture at Tortugas, known to me, is by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 237). It may be assumed that the species is rare at Tortugas as it is at Key West, where Bureau of Fisheries collectors took only one specimen during several years of intermittent collecting.

This species differs from the others of the genus in having the chest naked, except for a small triangular patch of scales in front of the ventrals. Adults have a steeper, more strongly convex anterior profile, a rather broader head and nape, and a more prominent black opercular spot than related species.

Tropical Atlantic, and northward on the coast of the United States. S. F. H.

Trachinotus falcatus (Linnaeus). POMPAÑO

A specimen 15 mm. long was taken in floating *Sargassum*. Others, 60 mm. long, were seined along the shore.

The smallest fish was rich dark brown with soft dorsal, anal, and caudal fins clear. At the preopercular angle it had a strong spine equaling three-quarters the ocular diameter. About the base of this were smaller spines, with 2 others, graduated, on the posterior, 2 on the inferior preopercular margin. The larger fish were pale grayish, silvery on the sides and below. Dorsal fin black along anterior margin and lobe; ventrals and anterior margin and lobe of anal orange. Preopercular spine not evident; form that of the adult, save that the contour is straight from eyes to origin of dorsal.

Occasionally large fish were seen during the summer at the shore of Loggerhead Key and about the Bird Key flats.

A female 82.5 cm. long, taken on July 1, 1933, measured 63.7 cm. to base of caudal, and was 28.7 cm. deep. D. VI-I,19; A. II-I,18. The dorsal lobe depressed reached to the base of the 15th ray, the anal lobe to the base of the 10th ray. The ventrals were 87 mm. long, the distance from ventral origin to anus 87 mm. The size of the ovaries indicated the breeding season.

In the mouth of this fish was a specimen of *Strombus bibericulatus*, and in the stomach were the foot and operculum, but not the shell, of another, with the chelae of the great hermit crab, *Petrochirus bahamensis*, and fragments of other crustaceans.

Another fish, a male, 75 cm. long, had the same fin formulas and the same proportions. In its alimentary tract were sea-urchin spines and pieces of their tests, and fragments of a small *Pitho*.

This large fish showed a healed wound involving the region from the 3d anal spine to the 11th ray, a linear distance of 100 mm. along the base of the fin. There had been no regeneration of fins or scales.

W. H. L.

This pompano is recognized by its deep body (depth generally less than 2 in length); the greatly elevated anterior lobes of the soft dorsal and anal in the adult; the rather small number of dorsal and anal rays (D. VI or VII-I,19 to 21; A. II-I,17 or 18); and by the plain color, no crossbars being present.

The collection contains 6 juveniles, ranging from 9 to 11 mm. in length, taken off West Buoy. The dorsal and anal rays are already well enough developed to permit a fairly accurate count, the spines being especially well developed. In 3 specimens the formulas are, D. VII,20; VII, 19; VII, 18; A. III,18; III,17; III,17, the first 2 spines not being separated from the 3d. The preopercle is provided with 3 very large spines, which are lost later in life. The caudal already is forked.

These young vary among themselves in color from nearly black to brownish with dark punctulations. The soft parts of the dorsal and anal and the caudal fin are abruptly colorless.

Atlantic coast of tropical America, sometimes as far northward as Cape Cod.

S. F. H.

Trachinotus palometa Regan

Chaetodon glaucus Bloch, Naturgesch. ausland. Fische, vol. 3, 1787, p. 112, pl. 210—Martinique (on a drawing by Plumier).

Trachynotus palometa Regan, Ann. and Mag. Nat. Hist., ser. 7, vol. 12, 1903, p. 349 (substitute for *C. glaucus* Bloch, regarded as preoccupied).

Sometimes appears in large schools about the Laboratory and lighthouse docks, and in smaller numbers about beach rocks east of the Laboratory.

Lobes of soft dorsal and anal elongated and black, as are lobes of caudal; four narrow vertical dark bars on side.

The stomach of one specimen, 175 mm. long, was filled with annelid fragments, and one *Jenkinsia lamprotaenia*.
W. H. L.

Gudger (Carnegie Inst. Wash. Pub. 391, 1929, p. 165) described a specimen 122 mm. long from Tortugas, giving the fin-ray formulas D. I-VI-I,19; A. II-I,17. Depth in standard length 2.2. Longley's and Gudger's specimens had only four dark crossbars, though five sometimes are present.

This pompano is more elongate than *Trachinotus falcatus* (depth generally more than 2 in standard length); the anterior lobes of the soft dorsal and anal are higher, sometimes reaching nearly to tips of caudal in adults; and it differs in color, having dark vertical bars on the side.

Caribbean Sea and northward to Virginia.

S. F. H.

Trachinotus carolinus (Linnaeus)

Dr. Longley did not list this pompano in his notes. It is included in the fauna of Tortugas on the basis of a record by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 238), who stated that it was rather common. Schroeder (Rept. U. S. Comm. Fish., app. 12, 1923 (1924), p. 12), reporting on the commercial fishes of Key West, said that it is taken there in small numbers during the winter. Dr. Longley may not have found it at Tortugas because his work was confined to summer.

This pompano is recognized by the rather numerous dorsal and anal rays (D. V or VI-I,22 to 25; A. II-I,20 to 23); by the low anterior lobes of the dorsal and anal; and by the plain color, which in adults is bluish green above, shading into the silvery on the belly, without crossbars.

On the coast of tropical America, sometimes as far north as Cape Cod.

S. F. H.

Trachinotus goodei Jordan and Evermann. PERMIT

This pompano seems to be mentioned only once in Dr. Longley's notes: "A large carangid of the sort in which I have lost grains. . . . It is the 'permit,' *T. goodei*." This fish was seen off Long Key while diving, and also south of Long Key.

Aside from the large size attained, this pompano is recognized by the rather elongate body (depth about 2.5 in standard length); by the short dorsal and anal fins (D. VI-I,19; A. II-I,17), with anterior lobes only moderately elevated, not

extending beyond base of posterior rays if deflexed; and by the plain color, no dark bars being present.

Southern Florida, and presumably the West Indies.

S. F. H.

Vomer setapinnis (Mitchill). HORSEFISH

Waste from the tern rookery on Long Key provided the single specimen obtained locally. This is 35 mm. long (standard length 27 mm.), depth 25 mm. D. VII-1,21; A. II-1,18; P. 19. The first 4 dorsal spines more or less elongated, the 2d and 3d much the longest, the former depressed attaining base of 7th ray; remaining spines of anterior dorsal short, strong, compressed, sharp-pointed; ventrals extending almost to the 2 anterior anal spines.

Color dusky above; sides silvery; a distinct black line from dorsal origin to pupil; a vertical dash of black as broad as the pupil and as high as the eye's diameter intersecting lateral line just behind its curved portion.

W. H. L.

This fish is rather rare also at Key West, especially during the summer.

It is recognized by the deep, very strongly compressed body; very steep, nearly vertical, anterior profile; prominently arched lateral line, with weak bony scutes in straight part; none of the rays of second dorsal or anal produced in adult, these fins being very low.

Atlantic coast of tropical America, straying northward to or beyond Cape Cod.

S. F. H.

Selene vomer (Linnaeus). MOONFISH

A single observation was recorded in Dr. Longley's notes, as follows: "Specimen of *Selene vomer* at surface in channel off south dock, Fort Jefferson—about 175 mm. long."

This species is not rare at Key West. It is rather surprising, therefore, that it was not seen oftener at Tortugas.

The deep ovate (depth about 1.2 to 1.5 in standard length), very strongly compressed body, with very steep anterior profile; the absence of bony scutes in the lateral line; and the greatly produced anterior lobes of the second dorsal and the anal in the adult distinguish the moonfish from other local species.

Atlantic coast of tropical America, straying northward to or beyond Cape Cod.

S. F. H.

Alectis ciliaris (Bloch). THREADFIN

Dr. Longley has only the note: "A single school of perhaps 12 at outer edge of reef off Laboratory dock. Anterior dorsal and anal rays produced and trailing filaments, twice as long as whole body, and extending behind it for half its length."

I may add that the dorsal and anal filaments are much longer in the young than in adults. I have seen young about 25 mm. long (at Beaufort, North Carolina) in which the filaments were four or five times as long as the body. Similarly, the ventral fins are very long in the young (about as long as the fish in specimens about 15 mm. long), becoming much shorter with age. On the other

hand, the pectorals are short in the young, and become proportionately much longer and falcate with age.

The ovate, strongly compressed body, the filamentous rays of the second dorsal and anal, and other fin developments already discussed distinguish this species.

Both coasts of tropical America, straying northward to Cape Cod. S. F. H.

Oligoplites saurus (Bloch and Schneider). LEATHERJACKET

This species is included in the fauna of Tortugas on the basis of a record by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 237), who stated, "Taken at Garden Key. . . ." Dr. Longley presumably did not see it. The species apparently is rare also at Key West.

It is recognized by its long, thin body (depth about 3.3 to 4.0 in standard length), which is plain bluish and silvery in life, covered with small linear scales embedded at various angles to each other; gill membranes separate; rakers in moderate number, about 13 to 15 on lower limb of first arch; D. V-I, 19 to 21; A. II-I, 19 to 21.

Both coasts of tropical America, straying northward to or beyond New York. S. F. H.

Family APOGONIDAE. CARDINAL FISHES

The species, in part, are closely related, and not well understood. Three recently described ones are included. For the convenience of those who may use this book, the principal differentiating characters of the species found at Tortugas are set forth in a key. S. F. H.

KEY TO THE GENERA AND SPECIES

- a. Dorsal spines normally 6; anal spines 2
 - b. Preopercle with posterior margin weakly to strongly serrate . . . *Apogon*
 - c. Color chiefly brownish, with few to many chromatophores on sides, at least some of them with silvery centers
 - d. Scales on caudal peduncle, counting close behind base of dorsal, in 6 rows from one lateral line to the opposite one; small canines in anterior part of upper jaw, and laterally in lower jaw; chromatophores on sides below lateral line, mostly 1 to a scale *pigmentarius*
 - dd. Scales on caudal peduncle in 5 rows from one lateral line to the opposite one; no canines, the teeth being small and of nearly uniform size; chromatophores on sides below lateral line more numerous *conklini*
 - cc. Color chiefly red in life, pale in spirits; no large chromatophores; with or without dark points, or a few large black spots, or a few black crossbars
 - e. No definite black markings; with or without dark points; no black spots or bands
 - f. Scales in median series before dorsal 5; preopercular margin weakly serrate *aurolineatus*

- ff. Scales in median series before dorsal 4; preopercular margin strongly serrate . . . *quadrisquamatus*
- ee. A black blotch under opercular spine; a black spot on upper part of side below base of posterior rays of second dorsal; a black spot or saddle on upper part of caudal peduncle at base of caudal
- g. Black spot below base of second dorsal fully half as large as eye; a black saddle on caudal peduncle; tips of second dorsal, anal, and caudal not perceptibly black; 3 rows of scales above and 3 below lateral line on caudal peduncle *maculatus*
- gg. Black spot below base of second dorsal smaller and better defined; a definite round spot on upper half of caudal peduncle at base of caudal, no saddle; tips of second dorsal, anal, and caudal black; 5 rows of scales above and 6 below lateral line on caudal peduncle . . . *pseudomaculatus*
- eee. Black bar between bases of posterior rays of second dorsal and anal; another at base of caudal
- h. Body comparatively short and deep, depth 2.8 to 3.2 in standard length; caudal peduncle 2.3 to 2.5 in head; head short, deep, not especially depressed above, 2.5 to 2.75 in standard length; gill rakers 12 or 13; pectoral with 10 rays *binotatus*
- hh. Body elongate, depth 3.5 to 3.9 in standard length; caudal peduncle 2.9 in head; head long, low, depressed above, 2.5 to 3.1 in standard length; gill rakers 17 or 18; pectoral with 12 rays *planifrons*
- bb. Preopercular margin entire *Apogonichthys*
- i. Ventral fins short, failing to reach origin of anal, usually only to vent *alutus*
- ii. Ventral fins longer, reaching beyond origin of anal, usually to or past middle of anal base *stellatus*
- aa. Dorsal spines normally 9; anal spines 2 *Synagrops*
- j. Body elongate, depth 4.0 to 4.6 in standard length; eye large, 2.9 to 3.0 in head; second dorsal and anal scaleless *bellus*

Apogon pigmentarius (Poey)

In Poey's description (*Memorias*, vol. 2, 1860, p. 123) of this species few differential characters are mentioned. He does write, however, "Toutes les dents en velours." It is surprising, therefore, that the specimen, 43 mm. long to base of caudal (*Mus. Comp. Zoöl.* no. 9753), which Poey's memoranda make the type has not all villiform teeth. The teeth in the upper jaw are in a villiform band posteriorly, anteriorly in two rows with 5 or 6 weak canines in the inner row; a band in lower jaw with several at side above tip of articular, somewhat enlarged

and canine-like; vomer with several strong teeth on either side and a number of much smaller ones before them; palatine teeth moderately strong, chiefly in a single series.

This is so unexpected one suspects that this specimen is not the type. A careful analysis of the evidence found in the records of the Museum of Comparative Zoölogy and of the data with this and other specimens sent by Poey, however, supports the assumption that this fish actually is the type.

Its squamation and pigmentation, as well as its dentition, usually distinguish *Apogon pigmentarius*. Scales ctenoid except on nape; 6 scales in median series before dorsal; caudal peduncle, in addition to median dorsal and ventral series, with 3 rows of scales above and 3 below lateral line. Chromatophores below lateral line chiefly 1 to each scale; a narrow dark bar at base of dorsal, and a broader, more diffuse one at base of caudal. W. H. L.

Though Dr. Longley does not mention the occurrence of this species at Tortugas in the foregoing account, it was taken there, as is shown by the presence of 2 specimens, 56 and 61 mm. long, in the collection. It is listed as observed or taken four times in Dr. Longley's notes, but these observations possibly are referable to *A. conklini*, as the two species seem to have been considered one for a long time. It may be assumed, however, that this fish is not numerous at Tortugas.

West Indies to southern Florida.

S. F. H.

Apogon conklini (Silvester)

Amia conklini Silvester, Carnegie Inst. Wash. Year Book No. 14, 1915, p. 215—Guanica Harbor, Puerto Rico; Carnegie Inst. Wash. Pub. 252, 1918, p. 21, pl. 3, fig. 1.

Amia gloverensis Mowbray, in Breder, Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 37, fig. 19—Washerwoman Cut, Bahamas.

The type of this species is lost; no trace of it is to be found in the museum of Princeton University, or in any other museum. Its picture in color, however, identifies it.

In hue it is much like *Apogon pigmentarius*, which is brownish rather than red. Some of its chromatophores are very large, as in that species, and in preserved specimens at least they also have silvery centers, which are most distinct on the gill cover and just behind and below the gill opening. The chromatophores, however, are more numerous in *conklini*, particularly on the sides below the lateral line. The dark bands on base of dorsal and anal fins are also characteristic marks, but do not persist indefinitely in museum specimens.

The slight variation in size of the teeth in *conklini*, in which none stand out distinctly above the others as in *pigmentarius*, distinguishes the two. In well grown specimens of *conklini* the scales are all ctenoid, and are larger than in *pigmentarius*. The last difference is especially noticeable on the caudal peduncle, where *A. conklini* has two rows of scales above and two below the lateral-line series, besides a median dorsal and ventral series, or two rows less in the complete circuit than in *pigmentarius*.

This species is rare in collections. At Tortugas, in shallow water at least, it is very rare; I have recognized only 4 specimens. The only specimen for which the place of collection is known came from Southwest Key. One was found in waste from the tern rookery.

W. H. L.

Dr. Longley's collection contains 5 specimens, ranging in length from about 40 (caudal fin broken) to 72 mm.

Bahamas, Florida Keys, Puerto Rico, and Atlantic coast of Panama.

S. F. H.

Apogon aurolineatus (Mowbray)

Apogon pigmentarius Metzelaar (not of Poey), Trop. atl. Vissch., 1919, p. 60—Curaçao. *Amia aurolineatum* Mowbray, in Breder, Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 35, fig. 18—Siguanea Bay, Isle of Pines.

I have had a single small specimen at Tortugas, found lurking in a crevice in coral at a depth of 10 to 12 feet.

Poey sent an unnamed specimen of this species to the Museum of Comparative Zoölogy from Havana. Two specimens, from Key West, Florida, are registered in the American Museum of Natural History (no. 2554) as *Apogon maculatus*. At least the larger of 2 specimens from Curaçao, identified by Metzelaar as *A. pigmentarius*, is in the Zoölogical Museum in Amsterdam. These and the type (Bingham Oceanog. Coll. no. 461) are all I have discovered in museum collections.

Median predorsal series of scales, five; two rows between them and lateral line; at least some in the median and submedian series cycloid; caudal peduncle with three rows above and below the lateral line besides a median dorsal and ventral row. In squamation alone, then, there are differences setting this species quite apart from *quadrisquamatus* with its four predorsal scales, from *pseudomaculatus* with ctenoid scales only, from *maculatus* with more scales on the caudal peduncle, and from *binotatus* and *conklini* with fewer, as well as from *townsendi*, if that is separable from *binotatus*.

Pectoral fins distinctively short, extending at most a very short distance beyond anal origin; teeth in villiform bands, none projecting sharply beyond the others; eye very small, with half or less than half the superficial area of that of *A. quadrisquamatus*; serration of preopercular margin sparse and weak; caudal fin very slightly emarginate. The color pattern lacks the sharp, dark markings of *maculatus*, *pseudomaculatus*, and *binotatus*.

Breder is of the opinion that the ventrals of the type have been lost and the wound healed over. No irregularity in squamation, however, indicates that the fish ever possessed them.

W. H. L.

I did not recognize this species among the specimens of Dr. Longley's collection now in the National Museum.

Dutch West Indies to southern Florida.

S. F. H.

***Apogon quadrisquamatus* Longley**

Apogon quadrisquamatus Longley, Carnegie Inst. Wash. Year Book No. 33, 1934, p. 257—Tortugas, Florida. Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 229, fig. 3.

***Apogon maculatus* (Poey)**

(Plate 3, figure 1)

?*Apogon americanum* Castelnau, Anim. Amer. Sud, Poiss., 1855, p. 3, pl. 3, fig. 2—Bahia. *Monoprion maculatus* Poey, Memorias, vol. 2, 1860, p. 123—Cuba.

Apogon sellicauda Evermann and Marsh, Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 143, fig. 40—Culebra Island, Puerto Rico.

Apogon brasilianus Gilbert, Proc. Washington Acad. Sci., vol. 2, 1900, p. 168, pl. 9, fig. 3—Mamanguape, Brazil.

This species, perhaps not distinct from *Apogon americanum* Castelnau, is the most common of its genus at Tortugas. It is indeed far commoner than one might suppose if observation were limited to daylight hours, as the fish avoid the light. On the reef flats east of Bird Key, or off Loggerhead Key, any greatly corroded skeleton of the larger corals may have 10 or more young lurking beneath it. Full-grown individuals are commonest in the coral stacks, although with dynamite they may be taken on bottom only moderately rocky. By day only an occasional glimpse of one deep down in the crevices between the heads may be seen, but at dusk as many as 4 have been observed together fully exposed, where none was seen earlier. How far afield they wander at night is not known.

Ground color red, paler at night: in life with a short black longitudinal stripe through eye, slightly less than width of pupil, sharply defined by white lines on iris, and by pale streaks on side of snout and head; details of these markings disappearing at death. A black spot usually fully half as large as eye under dorsal; a dark saddle of variable extent and intensity on caudal peduncle; no color in mouth; peritoneum white.

A small shrimp was taken from the stomach of one specimen, and it itself was twice recognized in the stomach contents of *Lutianus griseus* and *L. analis*.

The species practices oral gestation. A male (sex determined by dissection) carrying eggs with embryos in its mouth was obtained on June 5, and a female dredged in 40 fathoms on July 15 had eggs exuding from her body, indicating the time of breeding.

D. VI-1, 9½; A. II, 8½; gill rakers 5 or 6 + 14; scales in two rows above lateral line, or three if the small scales at base of dorsal are included; 24 scales in lateral line to base of caudal; 12 in series up and forward between anus and lateral line; five rows above lateral line on anterior part of caudal peduncle, six below (median rows excluded).

Identification of the Tortugas specimens with Poey's *maculatus* rests upon their almost perfect agreement with the original description, and upon comparison of specimens in museums. The size of the type, 90 mm. long, is almost conclusive, since other species of the genus in the vicinity of Havana do not seem to grow that large. The type was female, and there is in the Museum of Compar-

tive Zoölogy (no. 9745) a female, 88 mm. long, with a slightly frayed caudal, which is marked "Poey's original." In the U. S. National Museum (no. 8804) are 2 specimens in poor condition but clearly referable to this species. They came from Poey under the number 436, which is the number assigned to *maculatus* in his private collection and in all his publications relating to it. There can be no doubt, then, as to the identity of the Tortugas specimens with *Apogon maculatus*.

W. H. L.

The collection contains 28 specimens, ranging in length from 30 to 102 mm. The dark or dusky blotch below the opercular spine, another more definite one under the soft dorsal, and a dark saddle on the peduncle at base of caudal, which are larger (especially the two posterior ones) than in *A. pseudomaculatus*, serve as recognition marks. The absence of black on the lobes of the second dorsal and the anal also aids in separating this species from *A. pseudomaculatus*, and judging from the specimens preserved, *A. maculatus* attains a larger size.

Atlantic coast of tropical America, northward to southern Florida. S. F. H.

Apogon pseudomaculatus Longley

Apogon pseudomaculatus Longley, Carnegie Inst. Wash. Year Book No. 31, 1932, p. 301—Tortugas, Florida (notes, but no description; no type designated). Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 231, fig. 4.

Apogon binotatus (Poey)

Jordan and Evermann (Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 1109) have adequately summarized the original description, except that the term "sub-bifurcada," applied to the form of the caudal, is rendered "lunate," which is inaccurate. Poey mentioned no point, save color, in which this species differs from *Apogon pigmentarius*. The two, however, as appears from examination of the type (no. 9750) and other specimens (nos. 9747, 9755) in the Museum of Comparative Zoölogy, are sharply distinct. The 2d dorsal spine in *A. binotatus* is much stouter than the 3d, and usually extends as far as its tip; the posterior margin of the preopercle is more strongly serrate; the scales on the caudal peduncle are in two rows above and two below the lateral line, in addition to the median dorsal and ventral series.

Three specimens were found in waste of the tern rookery. The range of this species includes the shallow water of Bird Key flats. Specimens were occasionally taken by breaking up clumps of the fragile, branching coral, *Porites porites*, lifted bodily from the water, and with the diving hood others were seen lurking in the shelter of massive corals in the 15-foot holes near by.

Ground color variable, sometimes changing in a moment from vermilion to flesh color; pale phases shown at night, or amid light-colored surroundings; dark markings never disappearing wholly. The narrowness of the bars crossing body between posterior ends of bases of dorsal and anal, and at base of caudal, is distinctive. There are no white lines on the eye, as in *A. maculatus*; and the lobes of the vertical fins are not black-tipped, as in *A. pseudomaculatus*. W. H. L.

Because of the close relation between this species and *A. planifrons*, recently described as new, it seems desirable to furnish additional data. The following proportions, enumerations, and remarks are based on 3 specimens from Tortugas, ranging in length from 32 to 43 mm., and 1 larger one, 95 mm. long, from Cuba (U. S. Nat. Mus. no. 37529): Head 2.5 to 2.75; depth 2.8 to 3.2. Caudal peduncle in head 2.3 to 2.5; eye 2.9 to 3.5; snout 4.0 to 4.8; interorbital 4.5 to 5.3; maxillary 1.8 to 1.9; pectoral 1.7 to 1.9. D. VI-1.9; A. II, 8 or 9; scales before dorsal 5 or 6, in lateral line 25, on caudal peduncle 2 or 3 above and below lateral line in addition to a median dorsal and ventral series; gill rakers 12 or 13, including rudiments, on lower limb of first arch; pectoral with 10 rays; preopercular margin moderately serrate; 2d dorsal spine much stronger than 3d; ventrals reaching vent; pectorals reaching origin of anal; body rather deep; head not notably flattened above, the anterior dorsal profile being rather evenly rounded.

West Indies to southern Florida.

S. F. H.

Apogon planifrons Longley and Hildebrand

Apogon planifrons Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 232, fig. 5—Tortugas, Florida.

Apogonichthys alutus (Jordan and Gilbert)

No specimens were found in the collection, and nothing in Dr. Longley's field notes is identifiable with this species. However, in his copy of Jordan, Evermann, and Clark's *Check list*, this species is definitely checked and numbered, as his custom was with species belonging to the Tortugas fauna.

In his unfinished manuscript is the following:

"Jordan and Thompson's suggestion [Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 239] that *A. alutus* is identical with *A. punctulatus* [= *A. stellatus*] I believe incorrect. The possibility of the two being growth stages of one species is eliminated because the many small specimens of *A. punctulatus* examined, like the large ones, have long ventral fins. Sexual dimorphism also fails to explain the difference, for specimens with well developed ovaries and others with as evident spermaries are like one another in the same way. Besides the type (U. S. Nat. Mus. no. 30874), and a specimen from Puerto Rico, the U. S. National Museum has a Cuban specimen, 51 mm. (no. 37477), presented by Professor Poey."

Although Dr. Longley fails to state that this species was taken at Tortugas, it surely may be expected in that vicinity, especially as there is at hand, in addition to the specimens already mentioned, another one, 44 mm. long, taken off Beaufort (North Carolina) Inlet, in 13 to 14 fathoms. The Beaufort specimen agrees closely with the type. The following proportions and enumerations are based on the type and the Beaufort specimen, the ones based on the latter being enclosed in parentheses: Head 2.6 (2.6); depth 2.9 (2.6, a gravid female). Caudal peduncle in head 2.5 (2.6); eye 2.7 (2.9); snout 5.0 (5.2); maxillary 1.7 (1.6); interorbital

3.8 (3.3). D. VI-1,8 (VI-1,8); A. II,8 (II,8); scales largely lost in both specimens, about 20 pockets in lateral line; gill rakers on lower limb of first arch 9 (10).

This species, as already indicated, differs conspicuously from *A. stellatus* in the much shorter ventral fins, which in 3 specimens before me reach only to the vent, whereas in *A. stellatus*, in a dozen or more specimens examined, they reach well beyond the origin of the anal, usually about opposite the middle of the base, and sometimes to the end of the anal base.

West Indies to North Carolina.

S. F. H.

Apogonichthys stellatus Cope

Apogonichthys stellatus Cope, Trans. Amer. Philos. Soc., vol. 13, 1869 (1866?), p. 400—Nassau, Bahamas.

Apogonichthys puncticulatus Poey, Repertorio, vol. 2, 1867, p. 233—Cuba.

Apogonichthys strombi Plate, Zool. Anz., vol. 33, 1908, p. 393—Bahamas.

Apogonichthys melampodus Blosser, Ann. Carnegie Mus., vol. 6, 1909, p. 296—St. Croix.

Apogonichthys practices oral gestation, as is demonstrated by a specimen of *A. puncticulatus* (= *stellatus*) in the Museum of Comparative Zoölogy. My lone observation on the time of breeding at Tortugas is that the abdomen of a female taken on August 6 was greatly distended with roe.

Living *Pinna* shells on the flats inside Bird Key reef often contain this fish. On one occasion 23 of the mollusks were harboring 8 guests, lodging them, so to speak, in the attic, that space between the broad upper ends of the valves that the soft parts do not continually reach. Others came from a dead shell of the same sort. I have gathered "Spanish oysters" in other places, however, and obtained no inquilines, so it appears that the association is not everywhere equally intimate. One fish was taken from the shell of a living *Strombus gigas*, and from dead shells of the same species numbers of others were removed. One was found hidden in the frail empty test of a great and rare spatangoid, and others were secured in the mixed catches of seine or trawl.

This species is found during the day under such shelter as has been mentioned. From its behavior in the aquarium it seems that it is a nocturnal creature, as are most of its near relatives, for it hides all day under stones or other shelter provided, but at night it swims about freely.

Its color is highly changeable. At night in an enameled bucket it may be so pale as to be scarcely visible against the white background, but by day it is usually dark brown with one line still darker, among others, running obliquely down and back across the cheek. The borders of the soft dorsal and caudal fins are narrowly white-margined. There is a phase, too, in which, in addition to the oblique line from the eye, a dark bar crosses the nape and two broad bands are present under the dorsal fins.

This changeability in color explains in part the multiplicity of names the species has. The scales in the lateral line of the type of *A. puncticulatus* (Mus. Comp. Zool. no. 9695) are not 30, but 24 to the base of the caudal. The caudal fin is rounded neither in the type of *A. puncticulatus* nor in that of *A. stellatus*, but emarginate in both.

W. H. L.

The synonymy given remains as prepared by Dr. Longley, except that I have changed the order, having found that *A. stellatus* Cope has priority over *A. puncticulatus*. This cannot be otherwise, as Poey (see citation) compared his *puncticulatus* with Cope's description of *stellatus*, which he stated had been described in "Journal Acad. Phil., 1866, p. 400." I supposed that Poey intended to refer to the *Journal of the Academy of Natural Sciences of Philadelphia*, and accordingly searched that series, but without success. Next, I checked the reference given in current publications, namely, *Transactions of the American Philosophical Society*, volume 13, 1869, page 400. A volume in the Library of Congress contains a title page giving the contents of part 3 of the volume cited, wherein Cope's original description appears under article 13, bearing the date 1869, which is in agreement with citations in most recent books. Poey, however, knew of Cope's *A. stellatus* certainly as early as 1867 (Repertorio, vol. 2, pp. 217-240, published in November of that year), when he made a partly erroneous reference to Cope's description. It is certain, therefore, that Cope's name is the older one, and was published prior to 1869, possibly as early as 1866, as shown by Poey, and therefore clearly has priority over Poey's *puncticulatus*, which it must replace.

West Indies, Bahamas, and southern Florida.

S. F. H.

Synagrops Günther, 1887

We follow Norman (Discovery Rept., vol. 12, 1935, p. 11) in considering *Hypoclydonia* Goode and Bean a synonym of *Synagrops* Günther. S. F. H.

Synagrops bellus (Goode and Bean)

Dr. Longley did not prepare an account of this species, of which he listed in his notes 18 specimens, 40 to 175 mm., taken southeast of Tortugas, in 85 to 250 fathoms.

An error in the number of anal spines appears in the original description, where it was given as 4, whereas only 2 spines are present, as correctly shown in the illustration accompanying the description.

Four specimens, 40, 42, 92, and 107 mm. long, in the collection have the following proportions and counts: Head 2.9 to 3.25; depth 4.2 to 4.6. Eye in head 2.9 to 3.2; snout 4.75 to 5.1; interorbital 3.7 to 4.1; maxillary 2.2 to 2.5; caudal peduncle 3.7 to 4.0; pectoral 1.45 to 1.5. D. IX-19; A. 11, 7 or 8; scales lost, about 30 pockets; gill rakers on lower limb of first arch 14. Teeth in upper jaw minute, except for 2 enlarged curved ones anteriorly; lower jaw with 2 somewhat enlarged teeth in front, and 3 to 9 enlarged ones laterally.

The rather elongate body, the large eye, the large, oblique mouth with maxillary reaching about opposite middle of eye, the large, loosely attached scales, and the short, apparently scaleless soft dorsal and anal fins seem to characterize this species. The more numerous spines in the first dorsal separate this species from the others of the family known from Tortugas, all of which normally have 6 spines in the first dorsal.

Gulf Stream in moderately deep water.

S. F. H.

Family CENTROPOMIDAE. SNOOKS

Centropomus undecimalis (Bloch)

One female, 825 mm. long, was taken at the west shore of Loggerhead Key. The green of the dorsal side of the head extended to the tip of the strongly projecting lower jaw. W. H. L.

Though Dr. Longley reported this fish as new to the fauna of Tortugas (Carnegie Inst. Wash. Year Book No. 25, 1926, p. 241), there is an earlier record by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 239) under the name *Oxylabrax undecimalis*.

Atlantic coast of tropical America, northward to Florida.

S. F. H.

Family SERRANIDAE. SEA BASSES

Petrometopon cruentatus (Lacépède). CONEY

Not uncommon on caverned bottom east of East Key; occurs also among coral heads in the reef patches on Loggerhead bank.

Where observed in the field, this fish usually remained under cover in a phase uniformly dark, except as small brown spots might be seen through the dark ground color. Sometimes it was lighter when exposed for a short or long time. In the aquarium it appeared in a banded phase; soft dorsal and caudal with narrow white margins, and a submarginal dark band slightly less than diameter of pupil; entire body covered with small brown spots, darker at center, and smaller on head, smallest of all on dorsal surface of eye; alternating dark and light lines on head; two dark bands under spinous dorsal, two under soft dorsal, and one imperfectly defined on caudal peduncle; the four under dorsal showing a tendency toward doubling.

Petrometopon cruentatus coronatus (Cuvier and Valenciennes) seems no more than a transitory color phase of this species.

Atlantic coast of tropical America, northward to Florida.

W. H. L.

Cephalopholis fulvus (Linnaeus). GUATIVERE OR NIGGERFISH

Labrus fulvus Linnaeus, Syst. nat., 10th ed., 1758, p. 287—Bahamas (after Catesby).

Perca punctata Linnaeus, *ibid.*, p. 291—Bahamas (based on Catesby).

Gymnocephalus ruber Bloch and Schneider, Syst. ichth., 1801, p. 346, pl. 67.

Cephalopholis fulvus ruber and *Cephalopholis fulvus punctatus* Jordan, Evermann, and Clark, Check list, 1930, p. 309.

This fish is rare at Tortugas, where only one specimen, 130 mm. long, taken at 10 fathoms, was secured.

The commonly accepted varieties are color phases. The 130-mm. specimen taken at Tortugas was in a bright yellow phase. In life the coloration, as observed in Puerto Rico, is highly changeable, the fish often appearing brown above the level of the tip of the snout and the posterior part of the soft dorsal, an area including the eye; the color below and behind this being light cream, with blue

spots plainly showing; anal and ventral fins bluish; two small dark spots on caudal peduncle. When dead it is essentially black, with spots 1 or 2 mm. in diameter, which may be light with dark margins and dark centers, dark with light centers, or wholly light blue, and extend on the dorsal fin, but are few or lacking in the pectoral axil, into which the spots of *Petrometopon cruentatus* extend.

West Indies to Florida.

W. H. L.

***Epinephelus adscensionis* (Osbeck). ROCK HIND**

Rock hinds 175 to 225 mm. long, and occasionally 450 mm. or more, were seen about coral stacks in 1.6 to 2.2 fathoms of water, from which they do not seem to venture far during the day. The resting fish often supports itself on its pectoral fins so that an observer is able to see its lower surface as far back as its ventral fins.

The elements of a color pattern common among the species of its genus are visible in this one. An oblique line from snout through eye to posterior margin of the preopercle; dark blotches on dorsal fin from 4th to 6th and from 10th to 12th spines inclusive, continued ventrally by more or less definite bands slightly inclined forward; two others under soft dorsal, with an additional one on caudal peduncle, and another at base of caudal; irregular lighter areas between the bands. The body, including ventral side, membranes between bones of jaws, branchiostegal membranes, and fins covered with reddish-brown spots from 1 to 5 mm. in diameter; dorsal surface of eye spotted, just like adjacent surface of head, spots not confined to the field exposed when eyes are in resting position, but appearing on an additional area that permits the eye to be rolled out widely before the apparent continuity of pattern on head and eye is interrupted.

In coloration the fish is very changeable, being much lighter on white sandy bottom away from the shadow of coral heads than if under or among them. In tanks at night, or when hiding, or even when driven out over the sand in the daytime, it shows the dark banded phase.

W. H. L.

This species is of minor importance as a market fish at Key West, where it is taken chiefly with hook and line in rather deep water.

Southern Florida to Brazil.

S. F. H.

***Epinephelus niveatus* (Cuvier and Valenciennes)**

Serranus niveatus Cuvier and Valenciennes, Hist. nat. poiss., vol. 2, 1828, p. 380—Brazil.

Serranus margaritifera Günther, Cat. fish. Brit. Mus., vol. 1, 1859, p. 131—South America.

Serranus conspersus Poey, Memorias, vol. 2, 1860, p. 139—Havana.

Hyporthodus flavicauda Gill, Proc. Acad. Nat. Sci. Philadelphia, vol. 13, 1861, p. 98—Newport, Rhode Island (young).

Epinephelus flavolimbatus Poey, Repertorio, vol. 1, 1865, p. 183—Cuba.

Poey's *Epinephelus flavolimbatus* has more than once been reduced to synonymy under *E. niveatus*, only to be restored by later authors. I think, however, it has no claim to recognition. The differences in color which persuaded Jordan

and Evermann (Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 1156) to accept it in 1896, after rejecting it ten years earlier, seem not to be permanent.

I have had 6 fresh specimens, ranging in length from 55 to 180 mm., obtained in 30 to 58 fathoms.

The ground color of the smallest one was dark brown verging toward black; dorsal fin the same, its spinous part with a yellow border, its lobe pale; pectoral and caudal fins colorless; ventral and anal fins black; a faint mustache; a blue streak reaching from eye to a point above preopercular angle; three blue spots at base of dorsal, four or five on lateral line, about three each in two rows below line, and several on side of head behind eye.

A specimen 135 mm. in length combines in its color pattern the elements which have been held to distinguish *E. niveatus* and *E. flavolimbatus*. Its ground color is olive green above, lighter below; membrane of outer two-fifths of dorsal bright yellow, except toward end of soft dorsal lobe; pectoral and most of caudal colorless or nearly so; ventral and anal almost black; a narrow blue line extending from below eye to preopercular angle; upper part of opercle and preopercle with several blue spots about 1.5 mm. in diameter; five similar spots at base of dorsal, six along lateral line, and four others below it in vertical of the anterior four of the other two series; a black mustache; a black saddle on caudal peduncle; and a faint suggestion of a dark bar at base of caudal fin.

The same specimen has the fin formulas D. XI, 14½; A. III, 9½. Scales about 25-112 to 115-45 to 50; 70 with pores. Outer teeth in upper jaw fixed, those in inner row and all in lower jaw depressible, posterior ones in both series above rather strong canines; teeth on vomer and palatines; gill rakers above angle of anterior arch 7 including 3 rudiments, 15 below, the lower 2 very short; posterior margin of preopercle weakly serrate, with 4 rather strong divergent spines at its angle; opercle with 3 spines; ventrals as long as pectorals, and reaching slightly beyond anal origin; pyloric caeca 5 on one side, 3 on the other.

A specimen 180 mm. long had a yellow-margined dorsal, a streak from the eye, and blue spots on dorsal at spines 4 to 7, 10 to 11, and rays 4 to 6; pyloric caeca 5 and 3 respectively on the two sides.

W. H. L.

The collection contains 4 specimens, ranging in length from 52 to 165 mm., which retain the color markings essentially as described.

Atlantic coast of tropical America to Florida, sometimes straying northward.

S. F. H.

Epinephelus mystacinus (Poey)

I have had a single specimen, 320 mm. long, taken between 83 and 94 fathoms.

This fish has the same fin formulas as *Epinephelus niveatus*. Its lateral-line scales with pores, its teeth, and spines on the head are the same, except that those at the preopercular angle are not so sharp. Gill rakers 9 on upper, 16 on lower limb of first arch; mouth only faintly bluish within; ventrals as long as pectorals, and not reaching vent; pectorals brownish; ventrals dusky, particularly between rays; blue spots on dorsal fin, and more on body than in specimens of *E. niveatus*

with which it was compared. The blue streak across the cheek of *niveatus* is missing, but every one of the nineteen spots which may be made out in the smaller specimens of *niveatus* is represented in this larger specimen of *mystacinus*. The mustache and the dusky bar on the caudal peduncle are the same in the two. Pyloric caeca 6, compound, with many terminal branches, doubtless making the 150 to 200 with which *mystacinus* is credited.

I am not sure that this specimen is distinct from *E. niveatus*. If distinct, it is possible that a second specimen was incorrectly assigned to that species. This second one was 165 mm. long, and was taken between 47 and 54 fathoms. It lacked the yellow border on the dorsal fin, as well as the blue streak on the side of the head. Its blue spots on dorsal fin and body were more numerous than in other specimens of *niveatus*.

Atlantic coast of tropical America to Florida.

W. H. L.

***Epinephelus striatus* (Bloch).** HAMLET OR NASSAU GROUPER

(Plate 3, figure 2; plate 4, figure 1)

Common in the coral-gorgonian belt, but infrequent outside of it about the keys.

Appears always ready to feed by day. Some may be induced readily to take food from a diver's hand; others are shier. One that I fed frequently usually appeared promptly upon my approach from under the coral heads and got under foot or picked at my pockets, in which I had carried crawfish tails for it. It could scarcely be driven far enough away to photograph, and might easily have been captured with bare hands if it had not been so strong, hard, and slippery.

The commonest color phase, which is a resting one, is too clearly shown in the photographs (pl. 3, fig. 2; pl. 4, fig. 1) to require description. The chief of the dark elements in its pattern are the tuning-fork stripe on the frontal and occipital regions, the ocular stripes, the dark reticulations on cheek and opercle, the transverse bands on the body, and the dark rectangle on the upper surface of the caudal peduncle. Its shade varies, being much lighter over white bottom than dark. In the lighter shades the fish displays bands which do not then extend ventrally as far as in the darker shades. The black spot on the upper surface of the caudal peduncle is the only permanent marking. A dark triangle, continuing the base of the tuning-fork stripe on the upper lip, fits perfectly with the greater piece, although the two parts are separated by the considerable extent of inturned skin between the premaxillary and nasal bones. The ocular stripes are continued forward across the mouth to the lower jaw as if there were no interruption of continuity. The markings on the cheek and opercle are continued under the head, which is unusual in most bottom fishes. But the Nassau grouper often "stands" at so high an angle that the markings underneath are visible. When the fish swims, its banding becomes fainter, and may be very faint if the bottom below it is light, flat, and bare.

Change in coloration has been noticed that is unrelated to change in color or shade of the environment, or to change from rest to active motion. One individual was observed repeatedly displaying, when a red grouper came near it, a

phase never seen in any other Nassau grouper. This distinctive phase appeared five or six times and passed in perhaps a minute at each showing. The stripe through the eye, instead of being one of the darkest, became one of the lightest on the body, and the color on the side above the level of the pectoral was abruptly replaced by white, in which were only a few scattered dark marks.

Atlantic coast of tropical America, common in the West Indies and the Florida Keys. W. H. L.

Epinephelus morio (Cuvier and Valenciennes). RED GROUPER

(Plate 4, figure 2; plate 5, figures 1, 2)

By far the commonest of its genus, and the commonest representative of its family, *Hypoplectrus* probably excepted, in shallow water at Tortugas. It is strictly an individualist like its relatives, however, never schooling like the Lutianidae and Haemulidae. The young are common where they can find shelter under scattered pieces of dead coral on the Bird Key flats, and on rocky patches in the *Thalassia* belt west of Loggerhead Key. The larger fish are found in somewhat deeper water, their distribution on the reef, too, being governed largely by the occurrence of suitable cover.

This species feeds indifferently by day or night, for individuals taken both by day and by night contained recently captured prey. Other fish, octopuses, crustaceans, shrimps, small stomatopods, and crawfish are eaten. It almost always appears hungry, hence is easily caught. Sometimes individuals will feed from a diver's hand on first meeting him, and may later permit themselves to be touched though nothing is offered them.

In color it is one of the most changeable of fishes. In its most common phase, except for a few inconspicuous light spots it is of a uniform dark reddish brown above and lighter below. While in this plain phase it may lighten until it is pale gray. It also has a very common banded pattern, shown in plate 4, figure 2, which is subject to essentially the same variability in shade as the plain pattern. The banded phase is associated with rest, and the shade in which it is developed is correlated with that of the surroundings. The plain phase is less perfectly correlated with activity.

Most red groupers resting on bottom variegated with light and shade, or with patches of algae and gorgonians and bare sand or stone, are banded. Some, however, under these conditions, particularly if more or less completely withdrawn under cover, are uniformly dark; but none are uniformly light. When the resting fish starts up it almost immediately puts off the bands and usually assumes a relatively dark self-color. Over bare bottom, however, it may be very pale, and under certain conditions of illumination it may appear most unsubstantial. Only rarely the banding lingers during swimming. The return to the resting phase is usually prompt if the fish definitely settles to the bottom, but if it merely makes a temporary halt, the plain color may persist. The fish may be gray, with the ocular stripe almost the only mark shown. Two ocular stripes, in the banded light phase, cross the mouth to the tip of the lower jaw, on which a white spot separates them. Small individuals may show a greenish cast in turtle grass.

There are several modifications of the banded phase. First, the young, up to 150 or 200 mm. in length, may have the ocular stripe produced backward to intersect the dorsal fin, the general color of the fish then being wholly olive above the lower margin of the stripe and creamy below and behind it. Or the ocular stripe may terminate abruptly opposite the nape, and the V of the upper part of the first body stripe may be visible as an independent marking, the ventral and posterior parts of the body being light and plain as before. Sometimes in the first-mentioned phase the young may be active, but they may also show it at rest. Again, there is a phase, rarely shown, in which the ocular stripe instead of being the darkest may be the lightest on the body. Finally, there is a phase observed only once, in two well grown individuals. These approached each other snout to snout and finally lay with their heads overlapped, and rubbing their bodies together. They showed intensely dark ocular stripes, and the V of the first body stripe, but the bodies below these were very white, and exactly alike in the two. Judging from the behavior of the fish, this particular showing of color is largely dependent on an internal factor, and seems to typify changes observed by Dr. Townsend in the New York Aquarium, and ascribed by him, perhaps correctly, to the psychic state of the fish displaying them.

Atlantic coast of tropical America, common in the West Indies and the Florida Keys, sometimes straying northward.

W. H. L.

***Epinephelus guttatus* (Linnaeus). RED HIND**

Reported by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 239) as *Epinephelus maculosus*, but certainly rare in shallow water. I have not seen it.

W. H. L.

At Key West this grouper is fairly common in the market, being taken with hook and line at moderate depths.

Atlantic coast of tropical America to Florida, sometimes straying northward.

S. F. H.

***Promicrops itaiara* (Lichtenstein). JEW FISH**

Usually found on the bottom about the greater coral stacks, under ledges of the old shore line, and about sunken wrecks.

Food includes the spiny lobster, or crawfish. One fish was seen with the crawfish's antennae still protruding from its mouth as digestion of the hinder part proceeded.

The pattern is a blotched one, the shade being variable, but whether there are adaptive changes in color was not determined.

W. H. L.

This is a food fish of some importance at Key West, where large individuals often are "hitched" to stakes in shallow water with shark hooks in their mouths, awaiting disposal in the market.

Atlantic coast of tropical America, northward to Florida.

S. F. H.

***Alphestes afer* (Bloch)**

Epinephelus afer Bloch, Naturgesch. ausland. Fische, vol. 7, 1793, p. 12, pl. 327—Acara, Guinea.

Plectropoma chloropteron Cuvier and Valenciennes, Hist. nat. poiss., vol. 2, 1828, p. 398—Santo Domingo; Martinique.

Epinephelus lightfooti Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 59, 1907, p. 258, fig. 3—Santo Domingo.

Two only were seen in the field, under a small coral head. Four more were taken with dynamite, when similarly hidden.

The ground color is yellow-olive, thickly covered with brassy spots, smallest over the snout and interorbital region, and becoming larger posteriorly and ventrally. When the fish is at rest three lines of brown radiate downward or backward from the eye, the upper one reaching a vertical one beneath the first spines of the dorsal; two rectangular blocks, darker than ground color, on occiput and nape; five interrupted or blotched bands of still darker color on the body. Of these dark markings, all but the ocular system disappear when the fish swims.

The color at night is very different from that shown by day. Two dark bands then cross the body, being more definite, and less a mere series of blotches, than by day; the first under first 5 dorsal spines, the second under junction of dorsal fins; interspace between the two bands and the region behind the second much lighter in color than by day, and almost free from traces of the bands which are then shown.

Between the type of *Alphestes lightfooti* (Fowler) and a Puerto Rican specimen of *A. afer* of the same size (U. S. Nat. Mus. no. 50202), no more than Fowler have I succeeded in finding significant structural difference. Even the color markings the first retains after several years in alcohol differ relatively little from those of the specimen more recently collected, and in forms so changeable in appearance their peculiarity conveys to me no trustworthy suggestion of specific difference.

Atlantic coast of tropical America to Florida,

W. H. L.

***Mycteroperca* Gill**

Mycteroperca Gill, Proc. Acad. Nat. Sci. Philadelphia, vol. 15, 1863, p. 80 (*Serranus olfax* Jenyns).

Trisotropis Gill, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, 1865, p. 104 (*Johnius guttatus* Bloch and Schneider = *Perca venenosa* Linnaeus).

Jordan, Evermann, and Clark (Check list, 1930, p. 313) segregated *Trisotropis* anew from *Mycteroperca*, with generic rank. This seems premature in the light of the fact that one species, listed as *M. venenosa* in subsequent pages, is listed in the Check list as *T. venenosus*, and a synonym as *M. bowersi*. Again, *M. interstitialis* is listed twice under *Trisotropis* and three times under *Mycteroperca*, as follows: *T. interstitialis*, *T. dimidiatus*, *M. falcata*, *M. calliura*, and *M. phenax*.

W. H. L.

Mycteroperca venenosa (Linnaeus). YELLOW-FIN GROUPER

(Plate 6, figures 1, 2; plate 7, figures 1, 2)

- Perca venenosa* Linnaeus, Syst. nat., 10th ed., 1758, p. 292—Bahamas (after Catesby).
Bodianus apua Bloch, Naturgesch. ausland. Fische, vol. 4, 1790, p. 50, pl. 229—Brazil.
Johnius guttatus Bloch and Schneider, Syst. ichth., 1801, p. 77.
Serranus cardinalis Cuvier and Valenciennes, Hist. nat. poiss., vol. 2, 1828, p. 378 (after Parra).
Serranus rupestris Cuvier and Valenciennes, Hist. nat. poiss., vol. 9, 1833, p. 437—Santo Domingo.
Serranus petrosus Poey, Memorias, vol. 2, 1860, p. 136—Havana.
Mycteroperca venenosa apua Jordan and Eigenmann, Bull. U. S. Fish. Comm., vol. 8, 1888 (1890), p. 370.
Mycteroperca bowersi Evermann and Marsh, Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 158, fig. 45—Culebra Island, Puerto Rico.
Epinephelus (*Mycteroperca*) *bonaci* Metzelaar (not of Poey), Trop. atl. Vissch., 1919, p. 50, figs. 17, 18—Curaçao.

This common species appears to attain a larger size at Tortugas than any other grouper except the jewfish. In appearance it varies greatly with age and with the circumstances in which it is found. In the young the contrast between light and dark areas is sharper than in adults. At least, the dorsal dark areas are encroached upon by the intervening light ones till the fish has only a few dark spots dorsally on creamy ground, much more commonly in the young than in the adult. But at all ages the fish is highly changeable.

A large specimen on rough bottom appeared in a moderately dark phase, but as it swam five times its own length across bare sand it became pale, and as it came to rest under coral heads it turned almost black. Again, as it swam with leisurely motion three or four times its length over pale sand, its pallor returned. In the pale phase the rounded dark areas, with light reticulum between, are largely suppressed toward the ventral side. Color changes, however, are not always adaptive. A fish at the Laboratory wharf rushed so far into the shallows in pursuit of a snapper as to become stranded for a moment, when its color became very dark over white sand.

These fish are among those commonly inspected, supposedly for parasites, by *Elacatinus oceanops*, of which I have seen half a dozen examining them at once, while a pair of small *Anisotremus virginicus* conducted an independent survey.

By checking the material in Amsterdam I found that 2 specimens, 175 and 310 mm. in length, from St. Eustatius and Curaçao, regarded as *Mycteroperca bonaci* by Metzelaar (see citation above), belong to this species.

Without having actually had in hand specimens of *M. venenosa apua* Jordan and Eigenmann (possibly not of Bloch; see citations above), I venture to place it in synonymy. It is said to differ from the normal form only in color. Numbers of fish from deep water in a red phase became like those from shallow water when they were confined with them.

The type of *M. bowersi* is a normal specimen of *M. venenosa*, preserved in a dark phase such as often passes in a moment.

Atlantic coast of tropical America to Florida and the Bahamas. W. H. L.

Mycteroperca interstitialis (Poey)

Serranus interstitialis Poey, *Memorias*, vol. 2, 1860, p. 127—Cuba.

Serranus dimidiatus Poey, *ibid.*, p. 129.

Serranus falcatus Poey, *ibid.*, p. 138.

Mycteroperca calliura Poey, *Repertorio*, vol. 1, 1865, p. 181—Cuba.

Trisotropis chlorostomus Poey, *ibid.*, vol. 2, 1867, p. 231—Cuba.

Mycteroperca falcata phenax Jordan and Swain, *Proc. U. S. Nat. Mus.*, vol. 7, 1884, p. 363
—Key West, Florida.

Mycteroperca interstitialis Longley, *Carnegie Inst. Wash. Year Book No. 34*, 1935, p. 283.

A single individual about a foot long was observed and captured on rocky bottom at East Key.

It is notable for its changeable coloration. It appeared in a striped pattern, with a median light line on back, originating on tip of projecting lower jaw, lying wholly between and touching nostrils, a little narrower than interorbital, becoming narrower toward origin of dorsal, and continuing to base of caudal; upper part of side dark above level of lower margin of eye and horizontally to base of caudal, forming a dark lateral band, separated at tip of snout by the end of the pale median stripe; spinous dorsal largely yellow, particularly toward margin; pectorals yellow toward anterior margins; all other fins dusky, except upper and lower dark margins of caudal.

After this fish was captured, and somewhat hurt in the process, and as it was taken to the laboratory in a tub, it changed its appearance almost completely. Although the stripes did not disappear entirely, the fish acquired dark bands, consisting of a pair on interorbital, two on nape, two under spinous dorsal, one under soft dorsal, and one narrower than the others on caudal peduncle.

The foregoing, exclusive of the synonymy, was compiled from Dr. Longley's field notes. The synonymy is based on a published record by Dr. Longley (see citation above), who prepared a statement explaining how he reached the conclusions pertaining to the synonymy. The original is lost, however, and I have only a carbon copy, which is so indistinct that it can be read only in part. All that can be learned from it is that Dr. Longley reached his conclusions after examining specimens in various museums.

West Indies and Florida, sometimes straying northward.

S. F. H.

Mycteroperca microlepis (Goode and Bean). GAG

This species apparently is mentioned only four times in Dr. Longley's notes. These entries were all made in 1921, an indication that the species does not occur regularly in shallow water about Tortugas. Twice he observed it near the Laboratory dock, once south of Loggerhead Key, and once on Bird Key reef flats. Both young and adults, up to about 20 inches in length, were seen among gorgonians. One fish was seen swallowing *Bathystoma rimator* about a third its own length.

The following is based on a small specimen: D. XI,17; A. III,11; gill rakers about 14; nostrils subequal; angle of preopercle salient; teeth partly depressible.

Dr. Longley noted concerning color: "Saw a small gag with many spots in vertical bands. Posterior margin of caudal dark." This is the fish on which the

data already given are based. Concerning another fish Dr. Longley wrote, "Noted that *M. microlepis* has large power of change of shade." Then, concerning 2 large fish, each about 20 inches long, "The markings are scarcely sharper in adults than in young."

South Atlantic and Gulf coast of the United States, chiefly Florida. S. F. H.

Mycteroperca tigris (Cuvier and Valenciennes)

(Plate 8, figure 1)

Serranus tigris Cuvier and Valenciennes, Hist. nat. poiss., vol. 9, 1833, p. 440—Santo Domingo.

Serranus camelopardalis Poey, Memorias, vol. 2, 1860, p. 132—Havana.

Serranus felinus Poey, *ibid.*, p. 134—Havana.

Serranus rivulatus Poey, *ibid.*, p. 135—Havana.

Trisotropis reticulatus Gill, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, 1865, p. 105—Barbados.

Twice I saw a specimen of this species and studied and photographed it in the great reef patch at the northern end of Loggerhead bank.

The fish was changeable in shade, but showed always the same pattern. Entire side of head covered by netted light lines, surrounding darker spots of the average size of the pupil; nine light bars, narrower than the brown interspaces, crossing dorsal surface between orbital region and posterior end of soft dorsal, becoming lost about halfway down side in a ventrolateral system of mottling.

West Indies to Florida and Bermuda.

W. H. L.

Liopropoma aberrans (Poey)

Several specimens were taken south of Tortugas, between 40 and 60 fathoms.

D. VIII, $14\frac{1}{2}$; A. III, $8\frac{1}{2}$; P. 15; scales 3-48-15; gill rakers 3 and 2 rudiments above, 12 and 2 rudiments below angle on first arch. Head, in a specimen 55 mm. in standard length, 2.75; depth 3.66. Eye in head 5.0. Teeth in villiform bands in both jaws, inner ones larger in fore part of upper, and outer ones in lower jaw; all depressible; vomerine and palatine teeth present; pseudobranchiae well developed; lower jaw projecting; maxillary scaly, with a supplemental bone, reaching somewhat past posterior margin of pupil; preopercle weakly serrate; opercle ending in 3 points, the middle one terminating a distinct ridge; lateral line rising sharply anteriorly and descending steeply immediately behind end of dorsal; caudal slightly emarginate at the length of 70 mm.

Ground color yellowish, faintly flushed with rose dorsally; center of each scale with pale bluish spot; dorsal and caudal distinctly yellow; anal rather yellow; dorsal and ventral margins and caudal angles pale; pectorals transparent; ventrals white.

W. H. L.

Six specimens, 40 to 120 mm. in length, in the collection apparently are of this species. In some respects the published accounts do not agree with the specimens in hand. The large pores which are said to be present on the head are not very evident, and the preopercular margin is finely serrate instead of smooth as de-

scribed by Poey, though apparently indicated as very slightly denticulate in his drawing. The specimens are in agreement with descriptions, however, as to the long, falcate pectoral, which reaches opposite the vent, and as to the lateral line, which is sharply elevated anteriorly, running so near the back that only two rows of scales are between it and the base of the last dorsal ray, whence it drops rather abruptly to the middle of the caudal peduncle. In number of fin rays and of scales in lateral line, and in many other respects there also is agreement.

The following enumerations and proportions are based on a specimen 120 mm. long, 95 mm. to base of caudal: D. VIII,14; A. III,8; P. 15; scales 3-43-14; gill rakers 3 and 2 rudiments above, 13 and 2 rudiments below angle on first arch. Head 3.15; depth 3.95; pectoral 3.6; ventral 5.6. Eye in head 4.1; snout 3.2; interorbital 6.65; maxillary 2.0; caudal peduncle 2.8.

West Indies to the Florida Keys.

S. F. H.

Rypticus Cuvier, 1829. SOAPFISHES

Representatives of this genus were observed several times by Dr. Longley while diving on the reefs, but they generally were not recognizable as to species. Specimens also were taken at depths of 10 to 25 fathoms.

S. F. H.

Rypticus saponaceus (Bloch and Schneider)

This species was recorded from Tortugas by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 241). Dr. Longley did not identify any fish observed by him as this species, and there are no specimens in his collection.

Atlantic coast of tropical America to southern Florida.

S. F. H.

Rypticus arenatus Cuvier and Valenciennes

Two specimens, without specific data, 53 and 61 mm. long, were identified as this species by Dr. Leonard P. Schultz, of the U. S. National Museum.

These specimens are now without spots. The upper surface from snout to origin of dorsal, occupying the entire width of the interorbital, is pale. Below this, from snout through eye to gill opening, is a dark brown band. The lower parts of head, chest, and abdomen nearly to vent are pale, and the rest of the body is light brownish.

Atlantic coast of tropical America to southern Florida.

S. F. H.

Rypticus bistrispinus (Mitchill)

Dr. Longley listed a single specimen, 62 mm. long, taken in about 25 fathoms south of Tortugas.

The color is described in his notes as yellowish below a line passing from snout tangent to lower margin of orbit, thence to upper margin of pectoral base, bending down beyond tip of pectoral, forming a convex curve to ventral surface near anus; head above this dark brown; remainder olivaceous; from head nearly to end of dorsal freckled with fine brown spots; pectorals yellow; vertical fins colored like body and with white margins.

There is no specimen in the collection identifiable with the foregoing description.

West Indies and south Atlantic coast of the United States, sometimes straying northward.
S. F. H.

Centropristes philadelphicus (Linnaeus)

Perca philadelphica Linnaeus, Syst. nat., 10th ed., 1758, p. 291—America.

Serranus ocyurus Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 9, 1886, p. 468—Snapper Banks off Pensacola, Florida.

Dr. Longley did not prepare an account of this species, which he listed in his notes as *Centropristes ocyurus*. It apparently is not rare, as 24 specimens, 150 to 240 mm. long, were taken in five hauls, south of Tortugas, in 40 to 60 fathoms.

A. C. Weed in a recent paper stated that the specimen selected as type of *Serranus ocyurus* Jordan and Evermann is *C. philadelphicus* (Field Mus. Nat. Hist., Zool. Ser., vol. 20, 1937, p. 297). He found that another species of this genus, which he named *springeri*, exists in the Gulf of Mexico, where the type of *ocyurus* was taken. Some of Dr. Longley's specimens (U. S. Nat. Mus. no. 92060) were identified with *philadelphicus*.

Centropristes philadelphicus usually is distinguishable from *C. striatus*, with which its range overlaps, by its 19 to 21 gill rakers on the lower limb of the first arch instead of 21 to 23, by the doubly concave caudal, by the lighter color, and by the blotched or barred pattern.

The following notes are based on 3 specimens, 120 to 162 mm. long, taken in 40 fathoms: "Sometimes with a pattern as described by Jordan and Evermann [see citation above]. More often with seven bars, that is, the several series of spots united vertically. Caudal fin doubly concave, the 4th ray from the dorsal margin exerted. The filament twice the length of the fin."

This species, though taken only in deep water at Tortugas, is found also in shallow water at Beaufort, North Carolina, and elsewhere.

South Atlantic and Gulf of Mexico, northward to or beyond North Carolina.
S. F. H.

Diplectrum formosum (Linnaeus)

This is at once distinguishable from other Atlantic species by the outline of the dorsal fin, which is not emarginate between the spinous and soft parts. Specimens up to 75 mm. long may be found on a sandy strip which more or less clearly separates the *Thalassia* on Loggerhead bank from coral and alga-covered bottom to the west, and also along the sandy west shore. Larger ones, up to 150 mm. in length, may be found in small numbers on the sloping banks or parts of the bottom of the deep holes in Bird Key flats, but it is really common only in the 10-fathom channels within the lagoon, and on similar smooth sandy or muddy bottoms east of Bush Key and Bird Key reef.

The coloration is variable. In a phase in which it may be active, it is grayish, countershaded, and with longitudinal stripes of brown; two stripes from inter-orbital space to origin of soft dorsal; another extending from superior orbital

margin to end of dorsal base; ocular stripe most prominent, extending from snout to caudal base, and there followed by a conspicuous spot.

These fish may rest on the bottom, perched on their ventral fins. So resting, they may display bands, which may appear less distinctly in those resting out of contact with the bottom.

Individuals may have hiding places they hold as their own. Some they dig by lying down beside stones, vibrating their bodies rapidly, and throwing sand out in clouds; some they find ready made. Once they possess a shelter, day after day they may be seen beside it, darting in when approached by such fishes as the swift carangids.

Refuse from the Bird Key rookery examined included 1 specimen of 110 mm. They themselves feed largely on crabs and shrimps.

The species does not breed at Tortugas during the summer, as even in late August the gonads are still small, but all of one type, having the appearance of ovaries. In view of the normal hermaphroditism of *Diplectrum bivittatum*, this is sufficient indication that the same condition prevails here. I may note that *D. formosum* (Mus. Comp. Zoöl. no. 21767), 175 mm. long, has on the ventral side of its gonad, between the ovarian lobes and behind the point of bifurcation, just such a specialized part as yields spermatozoa in related species.

Atlantic coast of tropical America, sometimes ranging northward on the south Atlantic coast of the United States.

W. H. L.

Diplectrum bivittatum (Cuvier and Valenciennes)

Serranus bivittatus Cuvier and Valenciennes, Hist. nat. poiss., vol. 2, 1828, p. 241—Martinique.

Diplectrum radiale Jordan and Evermann (part not of Quoy and Gaimard), Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 1204. Meek and Hildebrand, Field Mus. Nat. Hist., Zool. Ser., vol. 15, pt. 2, 1925, p. 475, pl. 46, fig. 1.

This species has been regarded recently as the same as *Diplectrum radiale* (Quoy and Gaimard). Since it is so considered by Meek and Hildebrand, and is manifestly different from the Pacific form, which has long been considered the same as Quoy and Gaimard's Brazilian species, the authors mentioned have elevated the west coast form to specific rank. It may be distinct, but if so the fact must be established by comparison with Brazilian, not with West Indian material.

Twenty-five specimens up to 150 mm. in length were taken between 40 and 55 fathoms. In one, 155 mm. in length (standard length 115 mm.), the proportionate measurements are: Depth 3.8; head 2.9. Eye equal to snout, 4.0 in head; inter-orbital width 6.7. Scales 6-52 to 54-17, about 8 in series between eye and angle of preopercle, instead of 10 or 11 as in *radiale*.

This species may be readily distinguished from *formosum* by the form of the dorsal fin, the margin of which is very distinctly notched between the spinous and soft parts as it is not in *formosum*; also the 3d dorsal spine in *radiale* is twice as long as the 2d, whereas in *bivittatum* it is little longer than the 2d. The scales on the cheek are larger and in only 7 oblique rows in *radiale*, in strong contrast with the much smaller ones of *formosum*, which are in 11 or 12 rows.

The usual color pattern consists of rather faint dark stripes on a light ground,

the dorsalmost stripes consisting of a pair running from interorbital to base of spinous dorsal; the next running from upper margin of orbit to end of dorsal base; another passing from snout through eye to base of caudal, sometimes ending in a dark spot near base of that fin; dorsal straw-colored with submarginal and basal rows of blue spots, replaced posteriorly by blue lines crossing rays on the faintly yellow ground of soft dorsal: about six narrow blue lines across caudal.

West Indies to Florida and probably southward to or beyond the Atlantic coast of Panama. W. H. L.

Prionodes fuscus (Poey)

One specimen, 41 mm. long, was dredged in 40 fathoms off the entrance to Southwest Channel.

Its fin formulas are: D. X,12; A. III,7, the last ray being double in each fin; P. 18; scales in lateral line about 48; 2d anal spine much stronger than 3d, and nearly as long. Known for many years only from the type. This fish apparently is new to the United States fauna.

In basic coloration this species agrees very closely with *Diplectrum formosum*, the ground color being gray with faint lines of brown from the vertex along the dorsal base to the 4th or 5th spine; at a distance below, equal to diameter of the pupil, other lines similarly reaching the 3d ray; a dark line behind eye, passing to angle of opercle, becoming a diffuse stripe on body, where it is broken into a number of sections forming part of a series of transverse bands, of which five are recognizable, lying, respectively, before the dorsal, under spines 5 to 8, under spine 9 to soft ray 2, under rays 5 to 8, and at base of caudal. W. H. L.

The specimen described by Dr. Longley was not found in the collection.

West Indies, and now recorded from Florida for the first time. S. F. H.

Prionodes notospilus (Longley)

Serranus notospilus Longley, Carnegie Inst. Wash. Year Book No. 34, 1935, p. 86—Tortugas, Florida.

Prionodes notospilus Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 235, fig. 6.

Prionodes phoebe (Poey)

No account of this species was found among Dr. Longley's manuscripts. According to his notes, 39 specimens, ranging in length from 72 to 160 mm., were taken in four hauls at 35 to 40 fathoms.

One of the larger specimens, when fresh, was described as having a broad band of brown extending from 3d to 6th dorsal spine; a narrow line of the same color extending backward from posterior margin of this band, on fourth row of scales below dorsal, and lost in a blotch at base of 6th to 10th rays of dorsal; a broader parallel band on middle of side extending to base of caudal; a distinctive silver-white bar, extending upward on side from just in front of vent, bordered posteriorly by a ruddy mark.

The following notes are based on a specimen 72 mm. long: Body with stripes and bands together; interorbital band present; the band under spinous dorsal

sweeping downward from middle of 1st spine, intersecting back at bases of 4th to 6th spines, and crossing body just in advance of the silvery-white bar on side; another under middle of soft dorsal; with indications of stripes on nape and along base of soft dorsal; one stripe extending from level of upper margin of eye to end of dorsal base, and another from opercular lobe to base of caudal. The characteristic silvery band on the side from just in advance of the vent seems always present.

Dr. Longley also had the interesting note: "A specimen 160 mm. long had the ventral side of the gonad white. Though the eggs were immature, a few motile sperms were found in the whitish portion. Hermaphroditism, therefore, is indicated, as in several related species."

West Indies and Florida.

S. F. H.

***Prionodes baldwini* Evermann and Marsh**

In the summer of 1921 a species of *Prionodes* was rather common on dead *Acropora* bottom, beside one of the great coral shoals far up the Loggerhead bank.

In coloration the Tortugas specimens, except in being less red, differ little from the type material, which came from 15 or 16 fathoms. Therefore, with slight probability of error these Tortugas fish belong to *P. baldwini*. This is then another of the rather common serranids which display a much redder phase in deep than in shallow water.

A specimen taken with dynamite had the iris vermilion; a dark line or row of spots through the eye, almost to base of caudal; a second line tangent to eye above; a third at base of dorsal uniting with its fellow and running as one on dorsal side of caudal peduncle; three narrow brown lines on cheek, and two under jaw almost at right angles to those on cheek; an orange-yellow spot on opercle continued posteriorly as a yellow line as far as vent; base of pectoral orange; three to five bars and two spots brownish above and orange below behind pectoral, and below level of yellow line just mentioned; a brown spot above lateral line corresponding to last one on caudal peduncle; base of caudal with four brown spots of size of pupil; base of fin itself with two narrow reddish bars.

W. H. L.

A single specimen, 57 mm. long, is in the collection. The following proportions and enumerations are based on this example: Head 2.6; depth 3.0. Eye in head 4.5; snout 4.0; interorbital 8.5; maxillary 2.3; caudal peduncle 2.7; pectoral 1.3; ventral 1.3. D. X,12; A. III,7; P. 14; scales 4-43-12, seven oblique rows on cheek; gill rakers 7 and 3 rudiments; branchiostegals 6.

West Indies, here recorded from Florida for the first time.

S. F. H.

***Prionodes atrobranchus* (Cuvier and Valenciennes)**

At 40 to 80 fathoms, south of Tortugas, as many as 30 specimens were taken at once. It apparently attains a length of only about 125 mm., and differs from the type of *Prionodes atrobranchus* in little besides color.

Its fin formulas are: D. X,12½; A. III,7½; P. 16. Branchiostegal rays 7. Scales 4-46-12, with five oblique rows on the cheek. Proportional measurements of a representative specimen are: Total length 118 mm.; standard length 94 mm.; depth 2.8; head 3.1. Eye in head 3.0; preorbital width 7.5; interorbital 10. The type of *P. atrobranchus*, as measured by me, has a total length of 124 mm.; standard length 95 mm.; depth 2.7; head 3.05. Eye in head 3.25; interorbital 7.7.

The Tortugas fish is very lightly pigmented; merely dusky above, paler below; trunk to vertical of anal origin shimmering with metallic reflections; black lining of operculum, visible through opercle, giving the appearance of a distinct black opercular spot. The Brazilian specimen (type) is much darker and obscurely banded, and has a corresponding black opercular spot of like origin.

Florida to Brazil.

W. H. L.

Prionodes nigropunctatus Hildebrand

Prionodes nigropunctatus Hildebrand, in Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 236, fig. 7—Tortugas, Florida.

Serranus Cuvier, 1817

Dr. Longley described two new species from Tortugas under this generic name. One of these is listed herein as *Prionodes notospilus* in accordance with the manuscript prepared by him, where it undoubtedly belongs if *Prionodes* deserves recognition. It is different, however, with his *Serranus tortugarum*, which has the margin of the sub- and interopercle serrate, and the gill rakers long and numerous. A second species, represented by a single specimen, agrees in these respects with *S. tortugarum*. This species I have named *Serranus beta*. As these species are of uncertain generic affinities, it seems desirable to leave them in *Serranus* until further study is made, and the genera become more accurately defined.

S. F. H.

Serranus tortugarum Longley

Serranus tortugarum Longley, Carnegie Inst. Wash. Year Book No. 34, 1935, p. 87—Tortugas, Florida. Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 238, fig. 8.

Serranus beta Hildebrand

Serranus beta Hildebrand, in Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 239, fig. 9—Tortugas, Florida.

Dules subligarius (Cope)

Only one specimen, 31 mm. long, caught on "*Emblemaria* grounds," seems to be listed by Dr. Longley. Though this specimen was not found, the collection contains one 45 mm. long. The following counts were made: Branchiostegals 6; D. X,13; A. III,7; scales 6-42-14.

Concerning the color, Dr. Longley noted: Head before the scaled area with brown stripes on a gray ground, a pattern common in the young; a spot of brown on conjunctiva above; the dark line through pupil bordered above and below

by light lines on iris; body with a series of seven brown bands on a gray ground; these bands wider than the light interspaces, except the last two; the first three more or less divided by narrow light lines throughout the greater part of their length; the fourth much narrowed below; the third and fifth following it closely throughout its length; a conspicuous, subocellate black spot as large as eye in the fourth dark band, lying in part on back, and in part on soft dorsal; the last of the dark bars at base of caudal nearly black; all fins, except ventrals, more or less distinctly banded; bands on pectoral and caudal narrow, and indicated chiefly as series of spots on rays; those on dorsal and anal in part directly continuous with body markings; the last three on dorsal and last two on anal aligned with bands on caudal peduncle; ventrals light along their anterior margin, then dusky, becoming colorless posteriorly.

This species as here understood ranges from Beaufort, North Carolina, to the Gulf coast of Florida.

S. F. H.

Ocyanthias martinicensis (Guichenot)

A mutilated specimen, 80 mm. in length to base of caudal, was found in waste from the tern colony on Long Key. Premaxillaries and maxillaries are missing, the tips of all fins broken, and many scales lost; the following details, however, are still determinable: D. X, 15; A. III, 7; P. 17. Third dorsal spine longest, 4th and later ones of about one length; anal spines strong, 2d and 3d subequal; teeth in lower jaw in a single series except near the symphysis, none depressible; either side of lower jaw with a strong anterior canine directed outward and forward, 2 strong retrorse canines close together and much stronger than any adjacent ones just before the tip of the angular ones; vomer, palatines, and tongue covered, or almost completely covered, by villiform teeth; preopercle serrate; opercle ending in 3 spines, the median one much the strongest; gill rakers 26; scales strongly ciliate, 37 in longitudinal series.

The wide tooth-bearing areas on vomer, palatines, and tongue, the long 3d dorsal spine, and the strong median opercular spine seem diagnostic.

West Indies to Florida.

W. H. L.

Hypoplectrus Gill, 1862. VACAS

The West Indian species of this genus have given systematists much trouble, and their relations even today are imperfectly understood. Jordan, Evermann, and Clark (Check list, 1930, p. 321) listed them in their varied color phases as no less than fifteen varieties of *Hypoplectrus unicolor* (Walbaum). This is a situation so intolerable that I venture to set down a few observations tending to clarify it, although some are based on material Tortugas does not afford.

Of species of *Hypoplectrus* there are at least three, *puella*, *gemma*, and *indigo*, in Florida and the West Indies which are clearly distinct. The first two are Tortugas species, but the third was not taken there. It lacks the blue head markings of *puella*. It is less compressed through the humeral region than the other species and has the profile scarcely excavated above, and in proportion to the height of the dorsal fin the lateral line is farther from its base. *Hypoplectrus bovinus* does not differ from *H. indigo* structurally. It is a color phase in which the dark bar

through the eye is especially sharply defined. *Hypoplectrus indigo* is represented in the Museum of Comparative Zoölogy by 3 specimens, and in the U. S. National Museum by 2, all from Cuba.

In Poey's paper on the genus, in which seven new species are described (Memorias, vol. 1, 1852, pp. 60-76), the sex of the specimens he examined is repeatedly mentioned. The outward differences were so many, the fundamental structural differences so few, he seems to have suspected sexual dimorphism. Actually he found no evidence of it. Indeed, he seems to have discovered no males at all, although as many as 7 females in five of his species are mentioned.

The Museum of Comparative Zoölogy has some of the specimens, I have no doubt, on which Poey's record is based. There are probably others in the U. S. National Museum which received attention by him also. There are in these institutions 20 or 21 specimens, partially dissected, in all but 2 of which ovaries may be readily demonstrated. The other 2 are not demonstrably females, but are no more surely males. No males, but numbers of apparent females have been noticed in my own collections at Tortugas. It seems just to conclude, then, that in this genus functional hermaphroditism occurs, as it does in a number of other genera of the lesser Serranidae.

W. H. L.

Hypoplectrus puella (Cuvier and Valenciennes)

Plectropoma puella Cuvier and Valenciennes, Hist. nat. poiss., vol. 2, 1828, p. 405, pl. 37—Martinique.

Plectropoma ephippium Cuvier and Valenciennes, *ibid.*, p. 408—locality unknown.

Plectropoma crocota Cope, Trans. Amer. Philos. Soc., vol. 14, 1871, p. 466—St.-Martin, West Indies.

Hypoplectrus maculiferus Poey, Ann. Lyc. Nat. Hist. New York, vol. 10, 1871, p. 78—Havana.

?*Plectropoma guttavarium* Poey, Memorias, vol. 1, 1852, p. 70—Cuba.

?*Plectropoma gummigutta* Poey, *ibid.*

?*Hypoplectrus pinnavarius* Poey, Repertorio, vol. 2, 1868, p. 291—Havana.

?*Plectropoma chlorurum* Cuvier and Valenciennes, Hist. nat. poiss., vol. 2, 1828, p. 306—Martinique.

?*Plectropoma nigricans* Poey, Memorias, vol. 1, 1852, p. 71—Cuba.

?*Plectropoma accensum* Poey, *ibid.*, p. 72—Cuba.

?*Plectropoma affine* Poey, Memorias, vol. 2, 1861, p. 427—Cuba.

?*Pristipomoides vanderbilti* Borodin, Bull. Vanderbilt Marine Mus., vol. 1, art. 4, 1934, p. 113, pl. 1, fig. 2—Sombrero Light, Florida.

In the extended synonymy above are three groups of names. The first (unquestioned names) embraces forms which seem identical with *Hypoplectrus puella*. Nothing appears to distinguish them but fleeting changes in color and pattern such as any individual may show.

Since *H. ephippium* is a name introduced as a substitute for *H. unicolor* Walbaum, regarded as inappropriate, it would seem that a further reduction might be effected by relegating *H. puella* itself to synonymy. But the type of *Plectropoma ephippium* was not Walbaum's specimen, but another merely assumed to be the same, hence judgment is reserved for the time being.

Hypoplectrus puella shows a characteristic pattern of light blue markings on the head, including several spots on the preorbital margin, more or less elon-

gated dashes below and above the nostrils, and a crozier-like stripe with the eye in its crook and the straight stem running obliquely down and back on the cheek; vertical lines of the same color on the preopercle and opercle, two of them extending on the breast before the pectoral; body with many faint vertical lines of light blue; and soft dorsal and caudal barred with them.

Hypoplectrus vitulinus (Poey), of which I have seen no specimens, seems to differ from typical *H. puella* only in the absence of blue markings on the head and breast.

Fish with the elaborate pattern of *H. puella* may be seen on the reef at Tortugas in different shades. These vary from pale amber to dark red-brown, and each is itself variable. Broad bands, most distinct in the darker individuals, may appear in any individual in an instant, and vanish as quickly. One band in this phase passes through the eye and down across the cheek, being bordered anteriorly by a subocular blue streak; a second band at the nape, extending on the pectoral base, broad above and narrow below; a very broad band extending from 4th spine to 7th soft ray, sometimes interrupted at mid-level of side; two other bands, one before end of dorsal base, and the other at base of caudal; the upper part of the last darker and frequently persisting as a distinct saddle when all other traces of bands are lost; snout, interorbital occipital region, and web of dorsal from 3d spine backward sometimes nearly white, interrupting the continuity of the ocular, humeral, and first subdorsal dark bars.

Referring to group two of the names in synonymy (those with a single interrogation point), a slight difference in the color markings on the side of the snout is all that obviously separates *H. guttavarius* from *H. gummigutta*. Faint banding of the dorsal, as opposed to none, distinguishes *H. pinnavarius* from *H. guttavarius*. In fishes so variable in coloration as the vacas, the difference last mentioned seems quite unsubstantial. I anticipate that these three will be found to be one, which for the present may be called *H. gummigutta*.

Hypoplectrus chlorurus, *H. nigricans*, *H. accensus*, and *H. affinis*, of group three (designated with two interrogation points), agree in having no blue markings of the *puella* type. Their differences are chiefly in shade. *Hypoplectrus aberrans* differs from them only as the banded phases of *H. puella* or *H. gemma* differ from the nonbanded phases. They seem surely one, which until further reduction may be made should stand as *H. chlorurus*.

This discussion is intended to supplement that on the genus as a whole. With what has gone before, it indicates an irreducible minimum of three species, or four if *H. puella* proves to be distinct from *H. unicolor*. *Hypoplectrus gummigutta* seems a very doubtful species, likely to be merged with *H. puella*, and *H. chlorurus* more probably good, though in danger of being merged with *H. unicolor*, even if it proves distinct from *H. puella*.

West Indies to Florida.

W. H. L.

Hypoplectrus gemma Goode and Bean

This exquisitely colored species was hitherto known from only 1 specimen, recorded as from Garden Key. It has now been observed at various places within

the Tortugas group. All these specimens were small as compared with the type (U. S. Nat. Mus. no. 3422), which is 130 mm. long.

In their common color phase they are azure, with the upper and lower margins of the caudal dark blue or black. Resting in an aquarium tank, the same pattern of bands as in *Hypoplectrus puella* is often displayed.

The crescent-shaped caudal is distinctive. Fish of the same size in the other species show nothing like it.

Known only from Tortugas, Florida.

W. H. L.

Hemianthias vivanus (Jordan and Swain)

Four specimens, 55 to 95 mm. long, no two together, were taken in 40 to 60 fathoms.

The fresh fish were straw color, faintly rosy above; dorsal inclined toward orange, this color more distinct as it becomes more concentrated when the fin is deflexed; caudal and anal slightly yellow; lower jaw yellow at tip; a clear-cut yellow line from maxillary to eye, reappearing behind it; eye blue above and below, with both red and brassy shades between.

W. H. L.

At least 4 more specimens, 68 to 107 mm. long, appear to have been taken in 40 to 60 fathoms after Dr. Longley prepared the foregoing account. I find the following concerning 3 specimens taken together: "At all sizes dorsal spines with cirri. The yellow line from tip of snout is tangent to eye below and thence to edge of operculum opposite lower base of pectoral. Another yellow stripe from behind eye to upper base of pectoral. Ventral, caudal, and anal slightly yellow." The collection contains still another specimen, 177 mm. to tips of produced caudal rays, 123 mm. to base of caudal, which is larger than those listed by Dr. Longley.

Pronotogrammus aureorubens and this species are similar in appearance. They are most readily distinguished by the smaller eye in *Hemianthias vivanus*, which also has filamentous ventral rays in adults; a serrated subopercle and interopercle in part; and a single enlarged flat spine at the angle of the preopercle with only a few spines below it, the rest of the lower margin being smooth.

The following proportions and enumerations are based on a specimen 125 mm. long: Head 3.2; depth 3.15; pectoral 3.4; ventral to tip of longest filament 3.6. Eye in head 3.8; snout 4.15; interorbital 4.6; maxillary 2.25; caudal peduncle 2.5. D. X,14; A. III,8; P. 18; V. I,5; scales 6-47-16, seven oblique rows on cheek, two complete rows between lateral line and middle of dorsal base, and four at base of the last dorsal ray; gill rakers on lower limb of the first arch 28; branchiostegals 6.

Gulf of Mexico off coast of Florida.

S. F. H.

Pronotogrammus aureorubens Longley

Pronotogrammus aureorubens Longley, Carnegie Inst. Wash. Year Book No. 34, 1935, p. 87—Tortugas, Florida, Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 242, fig. 10.

Rhegma brederi Hildebrand¹

Rhegma brederi Hildebrand, in Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 244, fig. 11—Tortugas, Florida.

Family PRIACANTHIDAE. BIGEYES

Priacanthus cruentatus (Lacépède). GLASS-EYED SNAPPER

Specimens were occasionally seen in crevices of the beach rock, usually deep down in the fissures, sometimes using their fins to brace themselves and hold their place in narrow crevices. I observed this species only once fully exposed in broad daylight. On this occasion it appeared to have been driven from hiding in *Acropora* by the alternate thrust and tug of a ground swell. Yet, retiring as it is, it is not easily frightened, as one once permitted me to work beside it with hammer and chisel to cut a window through the coral that hid it from the camera. It comes out of retirement soon after sunset, and at dawn it may be seen once more, appearing by fours and fives, but shortly afterward it disappears again in the fastnesses of the reef. More than two score young, 45 to 75 mm. in length, were included in a few pailfuls of waste from the Bird Key tern rookery.

D. X, $12\frac{1}{2}$ to $14\frac{1}{2}$; A. III, $13\frac{1}{2}$ to $14\frac{1}{2}$; gill rakers about 16.

Feeding occurs chiefly at night. The food includes annelids, crustaceans of many kinds, and small fishes.

It is red or red-brown, with eleven silvery bands, unevenly spaced; lower half of body dotted with spots of silver a little less than pupil in diameter; soft dorsal, anal, and caudal with rows of dark spots between the rays.

Only once a normal change in coloration was noticed, as the fish in the morning before sunrise were far from their reddest, though their silver bands were very evident. Actually their color is very changeable. One struck with the grains became at once almost colorless, and another, shocked by dynamite, showed irregular red blotches on a silvery background.

A striking feature of this fish is its great lustrous eye, which in specimens 200 to 225 mm. in length may be 25 mm. in diameter, and amply justifies the popular name, glass-eyed snapper.

Tropical Atlantic, northward to Florida; probably also in the Pacific.

W. H. L.

Priacanthus arenatus Cuvier and Valenciennes

The habitats of *Priacanthus arenatus* and *P. cruentatus* seem quite distinct. The former was not taken in the shallows with *P. cruentatus*, but exclusively in the 12-fathom channels within the Tortugas group, and outside down to about 45 fathoms. The largest specimen secured was 310 mm. long.

W. H. L.

¹ Since the publication of the description of *Rhegma brederi*, my attention has been called to the fact that George S. Myers (Smithsonian Misc. Coll., vol. 91, no. 23, 1935, p. 2) has stated that *Rhegma* is a synonym of *Pseudogrammus*, a genus based on an East Indian species. No data are offered in support of the statement.—S. F. H.

This species is quite distinct from *P. cruentatus*. Its fin formulas generally are D. X,14 or 14½; A. III,14½ or 15½. It has about eight fewer rows of scales between the anal origin and the lateral line, counting the series in the usual way. Gill rakers 22 or 23 on lower limb of first arch.

Tropical Atlantic, occasionally drifting northward to Cape Cod. S. F. H.

***Pseudopriacanthus altus* (Gill)**

One specimen, 22 mm. long, was taken in 12 to 15 fathoms.

Color reddish, with three clear-cut dark bars fading in alcohol; spinous dorsal and anal black, this color extending also on base of soft fins; distal parts of these fins and entire pectoral and caudal colorless; ventrals black, their inner margins attached to belly almost to anus, not free as shown in Goode and Bean's figures (Ocean. Ichthyol., 1895, pl. 46, figs. 239, 240). W. H. L.

A second specimen is listed in Dr. Longley's notes, taken in 45 to 50 fathoms. The collection contains a specimen 50 mm. long, without definite locality label, which may be that fish. This species, then, seems to be rare in the vicinity of Tortugas.

The following enumerations and proportions are based on the 50-mm. specimen from Tortugas: D. X,11; A. III,10; scales 47; gill rakers 20. Head 3.4; depth 1.65. Eye in head 2.0; snout 5.45; interorbital 4.3; maxillary 1.6; pectoral 2.0; ventral 1.1.

The narrow preorbital and the preopercle are serrate; the spine at the angle of the latter is scarcely enlarged. The pectoral fins are short and rounded, but the ventrals are long, reaching base of first soft ray of anal.

Dr. Longley has the following on the larger specimen taken by him: "Red-brown, iris redder than body."

West Indies, and northward in the Gulf Stream.

S. F. H.

Family PEMPHERIDAE. DEEP-WATER CATALUFAS

***Pempheris schomburgkii* Müller and Troschel**

Pempheris schomburgkii Müller and Troschel, in Schomburgk, Hist. Barbados, 1848, p. 669—Barbados.

Pempheris mülleri Poey, Memorias, vol. 2, 1860, p. 203.

No account of this species was found in Dr. Longley's manuscript, and it appears to be mentioned only a few times in his field notes. In his copy of Jordan, Evermann, and Clark's *Check list* (1930, p. 323) he definitely assigned *Pempheris mülleri* Poey to the synonymy of *P. schomburgkii*, as shown above.

Dr. Longley stated in one entry that he noticed these fish in small schools among coral heads three days in succession. They were markedly transparent, the whole axial skeleton back of the abdominal region being visible; body coppery; distinct red line at base of anal. On account of the method of operation of the pectoral fins, which vibrated quickly, the fish moved with peculiar starts in

perfect rhythm as if dancing to music. In another entry he gave another description of the color, having at least 2 specimens before him, respectively 105 and 130 mm. long: "Color coppery, lighter below; peritoneum very slightly pigmented—mere scattered points."

The Tortugas collection contains 4 specimens, 44 to 101 mm. in standard length, which have been compared with some specimens from Cuba in the U. S. National Museum collection, identified as *P. mülleri*. The Tortugas material does not agree entirely with the Cuban specimens. It is not possible, however, to arrive at a definite conclusion concerning the relationship, as the Cuban material especially is not in good condition, and not enough specimens are available. Furthermore, the matter is complicated by some evident variation among the Tortugas specimens.

The specimens from Tortugas seem to be rather deeper and have a rather larger eye than Cuban ones of about equal size. The principal difference, however, is in the scales; those covering a large area on the anterior part of the side, especially the ones behind the pectoral fin, are prominently enlarged and very distinctly cycloid and have concentric rings on their margins, whereas in the Cuban specimens, though most of the scales are lost, enough remain to show that they are not prominently enlarged on the anterior part of the side and that their margins are definitely crenulate.

In having cycloid scales on the sides the Tortugas specimens are related to *P. polio* Breder (Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 32, fig. 15). Prominently enlarged scales are not mentioned in the description of that species, nor shown in the illustration. Furthermore, all the scales are not cycloid in the Tortugas specimens, those in the lateral line and those on the back behind the dorsal fin being distinctly ctenoid. In the 2 specimens of intermediate size the scales in advance of the dorsal also are ctenoid, though not in the other 2, and all except the smallest specimen have very strongly ctenoid scales on the chest and on the dentary bones. In the smallest specimen scales are missing on these parts, probably having been lost.

The smallest Tortugas specimen agrees with the Cuban ones in having the chest compressed to a more or less sharp edge, whereas in the larger specimens from Tortugas the chest is round and covered with scales.

It seems evident, then, that more specimens must be studied before the species of this genus can be accurately defined.

The following proportions and enumerations are based on the 4 specimens from Tortugas: Head 3.1 to 3.3; depth 1.9 to 2.2; anal base 2.0 to 2.15. Eye in head 2.0 to 2.2; snout 4.6 to 5.0; interorbital 3.5 to 3.9; maxillary 1.75 to 1.9; pectoral 1.1 to 1.2; ventral 2.25 to 2.5. D. III or IV, 9 to 11; A. III, 31 to 34; P. 15; scales in lateral line to base of caudal 56 to 62, about 10 or 12 more on caudal fin; gill rakers 17 to 19.

The color of the preserved specimens is uniform brownish, with a darker streak along the base of the anal.

West Indies to Florida, and presumably to Brazil. Not reported previously from United States waters.

S. F. H.

Family LOBOTIDAE. TRIPLETAILS

Lobotes surinamensis (Bloch)

(Plate 8, figure 2)

Only four observations of this species seem to be recorded in Dr. Longley's notes. Twice it was observed while diving; one specimen, 155 mm. long, was taken from underneath a floating box; and a young one, 40 mm. long, was taken from floating *Sargassum*.

There are in the collection 3 specimens, respectively 30, 36, and 154 mm. long. The tripletail, then, seems to be rather rare at Tortugas.

The largest specimen in the collection has the fin formulas D. XII,16; A. III,12. The serrations at the angle of the preopercle are quite large, the longest spine being rather more than half as long as the eye.

Concerning the color of a fish 40 mm. long, Dr. Longley stated, "Shade highly changeable. Nearly black in aquarium; much lighter in porcelain dish." In the preserved specimens prominent dark spots are present on the base of the soft dorsal.

Atlantic coast of America from Uruguay, sometimes northward to Massachusetts. S. F. H.

Family LUTIANIDAE. SNAPPERS

Lutianus griseus (Linnaeus). GRAY SNAPPER; MANGROVE SNAPPER

(Plate 9, figure 1; plate 13, figure 1)

This is the commonest of Tortugas snappers and in many respects the dominant fish in the local fauna. It gathers about all local wharves, along all submerged ledges of beach rock, about all the greater aggregated coral heads offshore, and in some isolated gorgonian patches.

Though the colonies on the reefs seek food only at night, at the Laboratory wharf the fish are always ready to feed. They eat bread, boiled potatoes, and beans as readily as fish or meat. They even rush out to intercept slowly falling paper napkins, showing that they see out of the water. Floating *Sargassum* they scrutinize intently, and they join carangids at the beach in a whirling, splashing, and confused pursuit of schooling round herrings and hardheads, but seem to catch few or none.

Of 26 specimens taken on the reef with dynamite at 5:00 P.M., 1 had in its stomach the two terminal joints of the large claw of a crab, *Portunus sebae*, the others nothing identifiable. Of 27, 215 to 415 mm. long, taken between 5:00 and 5:30 A.M., 6 had empty stomachs, 2 contained little, and the others had recently fed well. They had eaten at least 15 fishes up to 125 mm. in length, 10 crabs of the average size of a quarter-dollar, many small shrimps, a squid, and a large annelid.

The foregoing are representative observations, to which may be added the results of a few experiments and observations on the rate of digestion of food. A

colony of this snapper was fed with fish and crustaceans, which were marked by drawing a black thread through them. This marked food was offered between 2:25 and 2:35 P.M., and 5 of the fish were killed with dynamite $2\frac{1}{4}$ hours after the feeding. The stomachs contained the marked food listed: *Monacanthus* sp., 4 specimens, 45 to 63 mm. long; *Scarus croicensis*, 2, 35 and 40 mm. long; *Hali-choeres bivittatus*, 4, 50 to 63 mm. long; *Haemulon sciurus*, 2, 45 and 55 mm. long; *Malacoctenus macropus*, 1, 32 mm. long; *Mithrax hispidus*, 3, 11 mm. across carapace; and *Portunus* sp., 1, 21 mm. across carapace. Digestion had proceeded far enough in the fishes to destroy the color pattern, and in most instances to erode the abdominal walls. The crabs, however, remained virtually unchanged.

In a similar experiment 26 snappers were killed $3\frac{1}{2}$ hours after feeding. The stomachs, however, were not examined until an hour later. Only 5 of the fish contained marked food, consisting of the species listed as follows: *Jenkinsia lamprotaenia*, 5 specimens, 2 reduced to fragments, 3, 40 to 50 mm. long; *Hali-choeres bivittatus*, 6, 37 to 82 mm. long; *Pomacentrus* sp., 1, 55 mm. long; *Pomacentrus leucostictus*, 1, 55 mm. long; *Monacanthus* sp., 1 fragment, and 1, 30 mm. long; *Malacoctenus macropus*, 2, 30 and 33 mm. long; *Harengula sardina*, 1, 55 mm. long; *Syngnathus* sp., a fragment; *Sphoeroides spengleri*, 1, 50 mm. long; *Haemulon sciurus*, 1, 40 mm. long; *Sphyræna barracuda*, 1, 50 mm. long; *Sparisoma* sp., 1, 82 mm. long; *Portunus* sp., 1, 20 mm. across carapace; *Mithrax* sp., 1, 12 mm. across carapace; *Mithrax hispidus*, 3, 13 to 22 mm. across carapace; and a shrimp fragment. As already indicated, some of the food had been reduced to fragments, and in all the species of fish the bodies had more or less disintegrated, but in the crabs digestion had scarcely begun.

Sometimes at the Laboratory wharf the snapper colony exhibited the species' power of adaptive color change. Usually the fish there were in an intermediate gray phase, with or without an oblique dark line through the eye. Toward evening, however, over clear white sand I have seen them very pale, but over adjacent bottom covered with dark brown, dead turtle grass and algae they invariably and almost immediately turned quite dark. Along the beach rock, in the brown zone between the intertidal strip and stirred sand, I found gray snappers browner than in the other two places. Close beside or beneath *Orbicella* heads or in the thickets of *Acropora* they sometimes appeared in a blotched pattern, in which on a dark background there were light gray spots on the back at the base of the dorsal fin. About a shoal cutting off a lateral pocket from the upper blue hole inside Bird Key reef they sometimes floated high in ghostly gray; toward the eastern side of the main Loggerhead bank, in deep water, I have seen them high up, floating by hundreds in the same gray without even showing the ocular stripe.

W. H. L.

Dr. Longley reported some interesting observations in his article entitled "Life on a coral reef" (Nat. Geog. Mag., vol. 51, 1927, pp. 61-83, with figs.), showing that this snapper and the schoolmaster (and presumably others) mostly idle the days away in schools on the reefs, but when dusk comes the schools break up and the search for food begins. Dr. Longley also gave some interesting facts about the

food obtained, which seemed to show that the schools from different places have different feeding grounds. He pointed out, furthermore, that the food of the gray snapper and the schoolmaster is sufficiently different to show that they frequent entirely different feeding grounds.

In *Carnegie Institution of Washington Year Book* No. 24 (1925, p. 232), Longley, Schmitt, and Taylor reported at greater length on the conspicuous differences that appeared in the stomach contents of fish from the different colonies of gray snappers studied. The claim is made that it would be possible to determine, from an average sample of 10, from which of seven different sites the fish in question had come. The differences in the food of the gray snapper and the schoolmaster, also, are discussed in detail.

Dr. Longley carried on extensive experiments designed to provide further information¹ concerning the gray snapper's ability to discriminate colors. These experiments were reported upon in *Carnegie Institution of Washington Year Book* Nos. 22 (1923, pp. 161-163), 23 (1924, p. 193), 24 (1925, p. 228), and 29 (1930, p. 337). A brief review follows:

The plain-colored hardhead, *Hepsetia stipes* (listed as *Atherina laticeps* in the reports cited), was used as the food by means of which the color discrimination of the snappers was tested. The minnows, preserved in a weak solution of formalin in the earlier experiments, were painted in two color patterns with silver nitrate. One pattern consisted of a dark lateral stripe, extending from snout to tail, and the other consisted of two dark crossbars. The snappers (colonies under near-by piers) preferred the striped minnows, but did eat the barred ones too.

Then an attempt was made to make those of one pattern distasteful to the snappers by sewing into the mouth pieces of the tentacles of the medusa, *Cassionea*. After a time the colony of fish that had been fed with striped fish (for which they originally had shown preference) made distasteful with the medusa tentacles came to show a marked preference for banded fish. This preference was maintained afterward even though the medusa tentacles were omitted. Another colony of snappers similarly was taught to avoid banded fish.

The experiments were continued through three summers. No doubt remained that the gray snapper can distinguish color patterns, and that it can be taught to avoid certain ones, though the rate of learning seemed rather slow.

Dr. Longley was not satisfied, however, with the results of the experiments performed. Accordingly he made further investigations during the summer of 1929, in which he used fresh as well as preserved *Hepsetia stipes*. The earlier experiments were made with colonies of snappers living under one or another of the wharves of Loggerhead and Garden keys. The membership of these groups, it was learned, varied from day to day. In the new experiments 25 gray snappers of an average length of about 10 inches were confined alone in a land-locked part of the moat about Fort Jefferson. These fish soon learned to distinguish formalin-preserved from fresh minnows. Dr. Longley concluded: "The snappers' power of readjustment is great, and fresh fishes, even when they bear

¹ The ability of the gray snapper to distinguish colors had already been investigated to some extent by Jacob Reighard (*Carnegie Inst. Wash. Pub.* 103, 1908, p. 257).

the mark which has long distinguished the unpalatable ones, are usually eaten. But the effect of experience appears in the fact that striped fresh fishes [the mark that had been used for preserved fish] in my tests were rejected with twice the frequency of banded fresh ones. Striped fresh fishes, when taken, were taken too with greater hesitation than banded ones, and preserved striped fishes were rejected to the end very much more commonly than banded preserved ones. As a matter of fact, the latter are almost always seized before being rejected, whereas a large part of the former are allowed to sink to the bottom untouched. There seems, therefore, no reason to doubt that the gray snapper can discriminate between such simple patterns as those mentioned, and is able to form associations between either and the palatability or unpalatability of the food-fish displaying it."

Atlantic coast of tropical America, sometimes straying northward as far as Cape Cod. S. F. H.

Lutianus apodus (Walbaum). SCHOOLMASTER

(Plate 9, figure 2; plate 24, figure 2)

No account of this species was found among Dr. Longley's manuscripts. It is evident from his field notes that, next to *Lutianus griseus*, it is the most abundant snapper in the vicinity. Evidently it occupies about the same ground as *L. griseus* during daylight, as Dr. Longley's notes show that it was taken several times with that species in a single dynamite blast. At night, when feeding occurs, the fish seem to separate.

Records of the examination of 241 stomachs for food were found in Dr. Longley's notes. The three principal foods consisted of crabs, shrimps, and small fish, named in the order of their apparent importance, the fish being notably less numerous than crabs and shrimps. Among these foods, as far as they were recognizable, Dr. Longley listed most frequently the following: spider crabs (*Mithrax*), porcelain crabs (*Porcellana* and *Petrolisthes*), snapping shrimps (*Crangon* and *Alpheus*), and parrot fishes (Labridae and Scaridae). Foods of other groups were comparatively unimportant, except palolo¹ (a segmented worm) for a few days. Fragments of octopus appeared six times, worms (other than palolo) twice, clam once, isopod once, amphipod once, and *Dictyota* fragments three times (the last possibly taken incidentally in the capture of crabs and shrimps).

Though this species and the gray snapper occupy about the same grounds during the day, as already stated, they seem to feed separately on different grounds at night. For a comparison of the food of the two see the papers cited in the account of the gray snapper.

Schoolmasters seem to occur in nature in two color phases, designated as "pale yellow" and "banded." On a specimen 30 mm. long Dr. Longley has the follow-

¹ The reason for the occurrence of palolo worms for only a few days is explained in Dr. Longley's article entitled "Life on a coral reef" (Nat. Geog. Mag., vol. 51, 1927, p. 69); also in Carnegie Inst. Wash. Year Book No. 22 (1923), pp. 159-160; and by Caswell Grave in Carnegie Inst. Wash. Year Book No. 24 (1925), p. 227.

ing: "Body in banded phase grayish yellow. Each scale seems to have a yellow spot on grayish background, thus showing under lens a series of longitudinal yellow lines. In banded phase narrow lighter lines separate the dark bands, of which the first passes from anterior base of spinous dorsal through the pectoral base." A brown line, slightly wider than the pupil, extending from snout through eye to above posterior margin of opercle, and two narrow pale ones on the cheek seem to occur in both color phases mentioned.

An adult as observed in nature is described as dull brownish, this color being broken by bands; fins yellowish. Concerning a specimen between 125 and 150 mm. in length Dr. Longley observed, "In banded phase, lightens very distinctly in shade in passing from algae to bare sand."

Brazil, West Indies, northward to Florida, sometimes straying northward in the Gulf Stream. S. F. H.

Lutianus analis (Cuvier and Valenciennes). MUTTONFISH

(Plate 10, figure 1)

Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 241) reported that the muttonfish was caught in Bird Key channel in 8 fathoms. Dr. Longley listed it from reefs at Loggerhead Key, Bush Key, Long Key, Bird Key, and "inner lighthouse reef," and from White Shoal. This snapper evidently is common in the vicinity. At Key West it is perhaps a little less numerous than *Lutianus griseus*, which it outranks, however, in importance as a food fish.

Records of the examination of 29 stomachs were found among Dr. Longley's notes. Fish, largely small grunts, predominated as food. The only other food of any importance consisted of shrimps. Dr. Longley noted that this species, like the gray snapper and the schoolmaster, is a nocturnal feeder.

This snapper has a barred and a "self-color" phase, as indicated by Dr. Longley's statement in a field note: "On a bit of broken bottom near boat's moorings found half a dozen *L. analis*, 12 to 14 inches long. They were invariably banded when resting on bottom, whether with or without cover, and invariably changed to a self-color, except for minor reticulations and vermiculations, when swimming." A second observation confirms the first: "Resting muttonfish, 12 to 14 inches long, barred; not so when swimming." A third observation reads: "Large *L. analis*, 18 inches long, resting on bottom on shady side of coral head, dark and conspicuously barred. It swam off slowly as I approached, becoming much lighter with bands showing faintly."

Brazil, West Indies, to Florida, straying northward in the Gulf Stream.

S. F. H.

Lutianus jocu (Bloch and Schneider). DOG SNAPPER

(Plate 10, figure 2; plate 11, figure 1)

Lutianus jocu is much less abundant than *L. griseus* and *L. apodus*, but may always be found without great difficulty. It tends to collect near *Orbicella* stacks, the jagged *Palythoa*-covered reefs, submerged wreckage, and like places.

The color of this species is more olivaceous than that of the gray snapper in any of its phases. It is less inclined to orange than the schoolmaster. It lacks the dark lateral spot of the lane snapper and the muttonfish, and has a longer snout than the latter. The most distinctive mark, when displayed, is the light-colored triangular blaze on the cheek with its vertex reaching the eye, though in this detail the fish varies from moment to moment.

Brazil to Florida, straying northward to Cape Cod.

W. H. L.

***Lutianus synagris* (Linnaeus). LANE SNAPPER**

This species was reported by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 241) from "Isolated individuals, largely in eel grass." Dr. Longley also took it on grass flats and observed it on the different reefs, especially on "inner lighthouse reef." From the number of observations reported it may be concluded that it is less numerous than the gray snapper and schoolmaster, and about as common as the muttonfish and the dog snapper.

The feeding habits are not reported, but it probably may be assumed that this fish, like the gray snapper and the schoolmaster, feeds at night. At least Dr. Longley found it "resting" among the coral heads during the day. A record of the examination of the stomach contents of only one individual, 200 mm. long, was found. This fish was taken early in the morning and had fed on 7 or 8 small *Jenkinisia lamprotaenia*.

This snapper, like some of the others, appears in two color phases, described in part as follows in Dr. Longley's notes from a specimen 65 mm. long kept in confinement:

Banded phase: Broad dark bands, and eight narrow light ones. In this phase there is a light brown line running from the mouth, through the eye, becoming vague behind it. The dark spot of the unbanded phase falls within the fourth dark band from the posterior end of the series.

Unbanded phase: Grayish above, silvery below, with black spot above lateral line and beneath anterior part of soft dorsal. Same oblique dark line through eye as in banded phase. Narrow longitudinal stripes on body, three above lateral line and five below it.

The banded phase appeared whenever this particular specimen was placed in a small dish and left to itself. The light phase appeared whenever it was disturbed and set to swimming.

Brazil to Florida.

S. F. H.

***Lutianus vivanus* (Cuvier and Valenciennes)**

A single specimen, 200 mm. long, was taken in 40 fathoms, south of Tortugas.

W. H. L.

According to Ginsburg (Bull. U. S. Bur. Fish., vol. 46, 1930, p. 265, fig. 1), this species, though related to *Lutianus blackfordii*, has only 8 soft rays in the anal, and the scales are smaller, 72 to 73 oblique rows above the lateral line and 62 to 65 below it. Gill rakers are somewhat more numerous, there being 17 and 5 rudiments on the lower limb of the first arch, and the iris is described as bright yellow

in life, an observation confirmed by Dr. Longley in his notes, whereas the red snapper has a red iris.

West Indies, Gulf of Mexico.

S. F. H.

Ocyurus chrysurus (Bloch). YELLOWTAIL

(Plate 11, figure 2; plate 12, figure 1; plate 19, figure 2; plate 32, figure 2)

Few Tortugas fishes are more numerous than this species, which is found by hundreds among gorgonian thickets and *Orbicella* heads. In small numbers it has a very wide distribution throughout the group. Throughout the summer the young may be seined in abundance among turtle grass. The yellowtail's range extends from bottom to surface. It is, nevertheless, principally a fish of the middle depths, where it swims, when not feeding, usually 4 to 6 feet from the bottom in 12 to 15 feet of water.

Its time of feeding is not as closely restricted to the night hours as in other species of its family. Many do feed at night, but individuals may be seen by day following the red goatfish, for example, and competing with *Halichoeres bivittatus* for shrimps. Still others may be seen feeding at the surface in the deep water of the lagoon. *Jenkinia lamprotaenia* and other small fishes, shrimps, crabs, stomatopods, and annelids make up its food.

The trim body of the adult is delicately countershaded. In color it is blue-gray, marked with spots and lines of brassy yellow. Chief among these is the ocular stripe, which widens posteriorly, becomes confluent with others on the caudal peduncle, and spreads finally over the entire surface of the deeply forked caudal fin. The spots are confined to the upper half of the body before the mid-point of the base of the soft dorsal. Below the broad ocular stripe the series of yellow lines become fainter ventrally, and the lower also diminish in intensity as they pass from a comparatively exposed position on the side to the more shaded one beneath the caudal peduncle.

In coloration the yellowtail is changeable. Over clean sand fish are lighter in shade than in darker surroundings. Some over light bottom about the Laboratory dock at sunset reduced their yellow to pale straw color. The pattern varies, too, for a blotched phase is sometimes displayed on the reef by individuals at rest close to the bottom. The young show it regularly at night in aquarium tanks, or when hovering near the bottom in shallow dishes by day.

Brazil to Florida.

W. H. L.

Rhomboplites aurorubens (Cuvier and Valenciennes)

Three specimens, 140, 150, and 170 mm. long, are included in the collection. The 2 larger ones are without definite locality data. The smallest one was taken south of Tortugas in about 50 fathoms. As this is a rather deep-water species, it is probable that the others were taken in the same general vicinity.

The 3 specimens are all females with large roe. The smallest, the only one for which the date of capture is known, was caught July 2, 1932. The indication, then, is that spawning takes place during midsummer.

The following proportions and enumerations are based on the 3 Tortugas specimens, given in order of their size beginning with the smallest one: Head

3.0, 3.1, 3.15; depth 2.9, 3.25, 2.9. Eye in head 3.0, 3.4, 3.5; snout 3.6, 3.8, 3.8; interorbital 4.0, 4.2, 4.2; maxillary 2.7, 2.7, 2.6; caudal peduncle 3.1, 3.0, 3.1; pectoral 1.2, 1.2, 1.2; ventral 1.5, 1.6, 1.7. D. XII,11, XII,11, XII,11; A. III,8, III,8, III, 8; P. 18, 17, 17; scales (longitudinal series counted above lateral line) 8-73-17, 8-74-16, 9-74-16; gill rakers on lower limb of first arch 19, 18, 19.

The color of the smallest specimen when fresh was described by Dr. Longley as brilliantly scarlet, with faint stripes of yellow, those below lateral line extending from above pectoral base to above middle of anal, and those above lateral line oblique, following the rows of scales; pectoral rosy; caudal and iris scarlet.

This species is most readily recognized by its rather elongate body, projecting lower jaw, presence of teeth on the tongue, small scales in oblique rows above lateral line, and the deeply lunate caudal.

Atlantic coast of tropical America, sometimes northward to South Carolina.
S. F. H.

***Pristipomoides macrophthalmus* (Müller and Troschel)**

This fish apparently is not rare in rather deep water south of Tortugas. Records of the capture of 33 specimens, ranging in length from 75 to 230 mm., taken in 40 to 94 fathoms, were found in Dr. Longley's notes.

Three females taken August 14, 1934 were reported as having eggs, indicating that spawning occurs during midsummer.

The following proportions and enumerations are based on a specimen 147 mm. long: Head 2.75; depth 2.7. Eye in head 3.1; snout 3.8; interorbital 4.2; maxillary 2.3; caudal peduncle 3.25; pectoral 1.15; ventral 1.45. D. X,10; A. III,8; P. 15; scales (longitudinal series counted above lateral line) 7-52-13; gill rakers 17.

The following descriptions of color are from Dr. Longley's notes: "A silvery fish, faintly rosy over back; base of pectoral and margin of dorsal yellowish; caudal rosy, upper lobe rather yellow, with white margin above and below." Another specimen was, "Silvery, rosy over back. Fins, except ventrals and anal, faintly yellow. Base of pectoral and iris yellow." A 147-mm. specimen was described as "Rosy above, with suffusing of yellow; sides silver; iris yellow; pectoral yellow at base, the fin itself pale." In alcohol the specimens are pale silvery.

This species superficially resembles *Rhomboplites aurorubens*, from which it differs, however, in the deeply forked caudal and the larger scales, which are in series parallel with the lateral line on upper part of sides, whereas those of *R. aurorubens* run obliquely upward above the lateral line. Furthermore, the present species has no teeth on the tongue.

West Indies, apparently now recorded for the first time from Florida.

S. F. H.

Family HAEMULIDAE. GRUNTS

***Haemulon album* Cuvier and Valenciennes. MARGATE FISH**

Fish 250 to 300 mm. long have been seen at several points along the west shore of Loggerhead Key. Some were near the Laboratory dock, others far down the island around blocks of coquina. Large adults appear occasionally about coral stacks or on rocky bottoms offshore. In an isolated gorgonian patch on rocky

bottom in a bare sandy area east of the first shallow bank south of Loggerhead Key a dozen or two medium-sized ones could always be found. Sometimes a few young school about a ballast heap marking the site of a wreck.

This species has notable power of color change. In a common phase the head and body are pearl gray, delicately countershaded by dark spots on the center of the exposed part of each scale on back and sides, and the highly contrasting black on dorsal and caudal fins begins abruptly. Black and gray alike are dimmed if the fish sinks to the bottom and rests in the shadow of even the most sparsely branched gorgonian.

A specimen confined in an aquarium appeared usually as last described, but sometimes displayed a mottled phase like that of other species of grunt similarly placed. Whenever any attempt was made to capture it, or when it was otherwise disturbed, it responded by showing on a greenish-gray background a pattern of seven major stripes.

Brazil to Florida.

W. H. L.

Haemulon macrostomum Günther. SPANISH GRUNT; GRAY GRUNT

(Plate 12, figure 2)

Haemulon macrostomum Günther, Cat. fish. Brit. Mus., vol. 1, 1859, p. 308—Jamaica.

Haemulon chrysopteron Mowbray (not of Cuvier and Valenciennes), Bull. New York Zool. Soc., vol. 18, 1915, p. 1298, with fig.—Key West, Florida.

Haemulon mowbrayi Jordan and Evermann, Proc. Calif. Acad. Sci., ser. 4, vol. 16, 1927, p. 505—Key West, Florida.

One of the least common of the Haemulidae, living in water from 6 to 18 feet deep. Still, it is always to be found about some of the reef patches.

Like the other grunts, it is a nocturnal feeder. Four examples examined early in the morning contained recognizable food, in which none observed had shown any interest during the day. The recognizable food of the 4 examined, ranging in length from 275 to 325 mm., consisted of small crabs, fish, gastropods, sea urchins, starfish, amphipods, and an isopod.

In coloration this grunt is one of the most strongly marked species. It retains its juvenile pattern of stripes throughout life. Ground color muddy gray; stripes brownish black, with a conspicuous wash of yellow between the upper one and base of dorsal fin; a conspicuous spot of light yellow on dorsal surface of caudal peduncle; entire pectoral except scaly base, margin of dorsal (particularly the soft part), inner margin of anal, and a broad terminal band on caudal golden. In the field even the adult fish differ greatly in the amount of yellow shown. An aquarium specimen, 100 mm. long, was banded. One dark bar appeared before the dorsal fin, a second beneath the middle of its spinous part, becoming united with the first ventrally, and a third beneath the spinous and soft parts of the dorsal.

Atlantic coast of tropical America to Florida.

W. H. L.

Haemulon bonariense Cuvier and Valenciennes. BLACK GRUNT

Of the grunts, *Haemulon melanurum* alone is about as rare as this species. Usually it is seen singly. As many as 3 or 4 were seen only once with hundreds of common and yellow grunts.

This species is variable in appearance. Lurking in crevices among the corals it may be dusky gray or darker, with brassy spots. In the open it is lighter. The brassy pattern on its head is one of coarse blotches rather than clear-cut stripes. The mouth is wholly light red within.

W. H. L.

This species was first reported from United States waters (Tortugas) by Dr. Longley (Carnegie Inst. Wash. Year Book No. 21, 1922, p. 171). It ranges from Argentina to the Florida Keys.

S. F. H.

Haemulon parra (Desmarest). SAILOR'S CHOICE

(Plate 13, figures 1, 2; plate 14, figure 1)

Common, though not as abundant as *Haemulon sciurus* and *H. plumieri*. Single individuals or small groups are widely distributed, but great numbers have been observed at only a few places. The preferred schooling grounds appear to be the bare bottoms about the greater masses of coral on the reefs.

This grunt, like the others of its genus, feeds almost wholly at night. The stomachs of specimens taken in the early morning were well filled, containing much sand, with algae, mollusks, and annelids.

These fish are more greedy, more stupid, or less sensitive than gray snappers to the sting of the medusa, *Cassiopea*. Before beginning to refuse them they will eat many small fishes made unpalatable by sewing bits of the jellyfish tentacles in their mouths.

The sailor's choice is usually seen in a plain gray phase with countershading. It is darker near heads of coral, or low down above gorgonians, than it is out over bare bottom away from them. It may occasionally be seen swimming high above the bottom, when it may be very gray, retaining only a faint touch of yellow above the eye. At dusk it may also be seen in its palest phase over the sand near shore. It also has a striped phase, in which stripes and a caudal spot are well developed on a gray ground. This is shown most often by the younger fish, and infrequently by full-grown ones. Some, about 350 mm. long, on leaving dark beach rock and swimming over clear sand, not only at once reduced the size and intensity of the dark spots on their scales, but put off the dark lines of this striped pattern. The peritoneum is black; the mouth orange within.

Brazil to Florida.

W. H. L.

Haemulon carbonarium Poey. CAESAR GRUNT

(Plate 14, figure 1)

This species occurs not uncommonly in small schools about the coral stacks.

It feeds at night like the other grunts. Of 5 taken at 5:30 A.M., 3 contained no food; 2 had fed on small crabs, gastropods, starfish, and annelid worms. No feeding was noticed by day.

Marked changes in shade occur when the fish leaves the shelter of the coral heads to rest over the bare bottom. In the duskiest phase the fins and ventral side of the body, well up to the level of the dorsal margin of the pectoral base,

may be all black. In another the fins may be all light except the caudal, which may show a dark band like that of *Haemulon sciurus*. In color the two species are somewhat alike, but are distinguishable at a glance because the lines of yellow are much more regular in *H. carbonarium*. The mouth is pale salmon within and dark at the angles. W. H. L.

Dr. Longley first reported this species from United States waters (Carnegie Inst. Wash. Year Book No. 21, 1922, p. 171). It has also been taken by Bureau of Fisheries investigators at Key West (unpublished), where it seems to be rare. It ranges from Brazil to Florida and Bermuda. S. F. H.

Haemulon melanurum (Linnaeus). FRENCH MARGATE FISH

A single specimen on one occasion, 2 on another, a few young on a third, and a larger number of partly grown fish on a fourth, are all that have been seen in a dozen summers. Three times they were found over clean white sand, or bare white coral skeletons about a small or larger group of massive corals. In the fourth instance they were gathered about a ballast heap marking the site of a vanished wreck.

In its pattern of black and white it sufficiently resembles one or the other of two phases of *Haemulon album* to justify its common name. But close comparison of the patterns of the two serves to distinguish them. In each, in one phase a conspicuous black area lies above the line joining the base of the first dorsal spine and the tip of the lower lobe of the caudal fin. But in *H. melanurum* this black is broadly and sharply white-margined dorsally and posteriorly, whereas in the other it is very narrowly white, if white at all. In addition, stripes appear in *H. melanurum* at all times in more or less dusky yellow on a pearly gray background. The line through the eye to the base of the caudal is darkest, and both it and the others may be distinctly enhanced in fishes among algae and gorgonians, as compared with those over bare sand. There is a distinct black spot under the posterior margin of the preopercle, and the roof of the mouth posteriorly and the lower jaw laterally are orange-red within. W. H. L.

This grunt was first recorded from United States waters by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 242). It has been taken also at Key West (unpublished) by Bureau of Fisheries investigators. It ranges from Florida to the West Indies and presumably southward. S. F. H.

Haemulon sciurus (Shaw). YELLOW GRUNT

(Plate 13, figures 1, 2; plate 14, figure 2; plate 15, figures 1, 2; plate 18, figures 1, 2)

One of the commonest of Tortugas fishes. It feeds by night, and by day is found gathered in small or great groups. The preferred schooling grounds are about the larger coral stacks or in the denser growth of gorgonians. Most of the fish that come into very shallow water are very small.

At their various schooling places the behavior of the fish varies to a certain

extent with the nature of their surroundings. When they are about the coral stacks they often retire within them, but the great majority stay outside. About the stacks or on comparatively bare ground on the Bird Key flats they usually lie rather close to the bottom, or more rarely float a yard or so above it. In the dense patches of gorgonians they seem to lie by preference near bottom, in the deep undergrowth, although some float at mid-level and some even rise above the gorgonian tops.

At dusk the schools break up and scatter over the reefs. The food they gather consists mostly of crustaceans, mollusks, and annelids. On the day of the annual palolo swarm¹ these worms are eaten in very large numbers. Small ophiurans occur not uncommonly in the stomach contents.

The yellow grunt is very changeable in coloration. It appears most commonly in what may be called the black-finned phase. It is then marked by a number of longitudinal stripes of blue and yellow in alternation, which by comparison are much more regular than similar markings on other species of the genus. The yellow lines are more brassy on the lower parts of the body, gradually becoming browner the higher they fall in the series. Pale bluish lines on side and head; soft dorsal, and a broad bar covering most of caudal fin, black. In this phase it is very clear that the fish has considerable ability to change its shade in adaptation to that of the substratum. Half-grown fish seen over white-silted turtle grass were very light in color. Sometimes when schooling about bare banks in or near deep holes the fish rise and float a yard up in the open water with *Lutianus griseus*, and are almost as inconspicuous. Their entire bodies then are gray, and the fins faintly straw color, except the caudal, which is very faintly dusky. When they lie on bare bottom which is not smooth, they sometimes show a mottled or clouded phase. A pattern of stripes sometimes appears in fish one-third grown when they are over alga-covered beach rock, and it may appear in full-grown fish over similarly covered bottom among the gorgonians. The mouth is red within.

Individuals may engage in pushing with open mouths with others of their species, or with other species of the genus. Sometimes the pose is assumed with wide-open mouth without contact being established. The display sometimes seems to occur without particular cause. At other times it seems to result from intrusion of one upon the privacy or preserve of another. One fish may so meet, one after another, all other fish that approach it.

Brazil to Florida.

W. H. L.

Haemulon plumieri (Lacépède). COMMON GRUNT

(Plate 14, figure 2; plate 15, figures 1, 2)

A very common nocturnal feeder that schools by day about coral stacks and among gorgonians.

It feeds on worms, gastropods, lamellibranchs, and crustaceans.

In coloration this species is changeable. In its commonest phase about the coral stacks it shows a pattern of longitudinal brassy lines, somewhat wavy, and tend-

¹ Palolo worms are available to the fish only while they spawn, as explained by Dr. Longley (Nat. Geog. Mag., vol. 51, 1927, p. 69; also in Carnegie Inst. Wash. Year Book No. 22, 1923, p. 159).—S. F. H.

ing to be divided throughout their length by thinner lines of the same blue that separates them. Posteriorly the dark stripes are lost in the checkered pattern of dark and light which covers the body. The whole appears in a shade that matches the surroundings. Over sand near coral heads, even the darkest brassy spots may fade until they are little deeper than straw color. But in and over the corals, duskiness suffuses them until the fish's brassy olive cast repeats that of the corals themselves. Browns that are nearly uniform, except for countershading, match the dark *Plexauras* when the resting fish is hidden among their branches.

In a less common phase this fish is marked broadly with three dark lines which are not as sharply delimited from the light background as they are in other species of the genus. In still another phase appearing sometimes in fish in tanks, which is hinted at rather than clearly developed in resting fish on the reefs, a blotchy pattern of dark and light is shown. Two fish gaping at and pushing each other gave, in contrastive brown and silver, the most perfect exhibition of this phase observed. In passing I note that the common grunt indulges in these displays of pugnacity toward yellow grunts as well as others of its own kind.

Brazil to Florida, sometimes straying northward.

W. H. L.

***Haemulon flavolineatum* (Desmarest). FRENCH GRUNT**

This fish may be found along ledges of beach rock, among gorgonians on rocky bottom, and most commonly about patches of massive or branching coral.

Although the French grunt will feed by day, 11 specimens taken at 5:00 P.M. were empty, suggesting that little feeding is done except at night.

Sometimes it is scarcely darker than straw color, but changes in shade occur when it passes from sandy bottom into the immediate neighborhood of corals. The fish sometimes displays alternating bluish and brassy lines, those on the side above and behind the pectoral fin running up and backward at an angle of nearly 45° . At other times the dominant elements in its coloration are dark lines, its ocular stripe of the width of the pupil contrasting sharply with the lighter color of the iris above and below. At other times, as when the fish rests near bottom in tanks, its pattern is one of blotches or irregular bands; but no fish so marked has been seen in the field.

Grunts of this species, like some of the others, are accustomed to face and push one another with open mouths. It was noticed that in one instance a pair so engaged were in the common light unstriped phase.

Brazil to Florida.

W. H. L.

***Bathystoma aurolineatum* (Cuvier and Valenciennes)**

Eighteen specimens, with many other fishes, were taken with the otter trawl in 40 fathoms, south of Tortugas.

Atlantic coast of tropical America, northward to Florida.

W. H. L.

***Bathystoma rimator* (Jordan and Swain). TOMTATE**

Tomtates school by day about the coral stacks and elsewhere. The relations of this species with the coral are, however, less intimate than those of some other *Haemulidae*.

A vernal breeding season is indicated by the fact that in the early summer the very young are far more abundant than fish of larger sizes.

Copepods provide much of the food. A thousand by estimate were taken from the stomach of a 50-mm. fish.

The young are very much like the grunts of the genus *Haemulon* in appearance. They occur commonly in a gray phase with the various dark stripes of the typical haemulid pattern well developed. The caudal spot is imperfectly double or dumbbell-shaped, with its long axis horizontal. Large fish may be similarly marked, or may lack the dark lines and caudal spot, in which case, except for their countershading, they are uniform faint green-gray. Schools of young, up to perhaps 100 mm. in length, have been seen in the gray phase high above the corals in open water. They lacked the dark line, but not the caudal spot, and when they returned to the coral heads they displayed again their common striped pattern. On being transferred from a black to a white dish in the laboratory, within 5 seconds the fish changed from its darkest color to its palest pearl gray.

Atlantic coast of tropical America, sometimes straying northward at least as far as North Carolina.

W. H. L.

***Bathystoma striatum* (Linnaeus)**

This species was reported from Tortugas by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 242). Dr. Longley apparently did not find it there.

It is easily distinguished from the other species of the genus by the smaller scales, there being from 65 to 72 in a longitudinal series above the lateral line, whereas the other two local species have only 50 to 60. From *Bathystoma rimator* it differs prominently also in the much more elongate fusiform body, the depth being contained about 3.4 to 3.8 times in the standard length.

Brazil to Florida and Bermuda.

S. F. H.

***Brachygenys chrysargyreus* (Günther)**

(Plate 16, figure 1)

This species abounds about the corals, to which it holds more closely than do some of its associates, notably *Bathystoma rimator*. It is particularly common in the branching and tangled *Acropora* beds. Its widest excursions from such cover by day are not often more than a very few yards. Some, however, have been seen swimming high up in the water, feeding on the tideward side of the coral heads.

The stomach of a fish feeding as described contained 21 copepods, an amphipod, an ostracod, and a crab zoea. It usually feeds by night, when it may be taken in abundance at the shore, hundreds of yards from its nearest schooling places. Stomachs of individuals so taken contained shrimps.

The color pattern is a simple one of longitudinal bluish and bronze stripes. They are lightest where most shaded by the rounded side of the body, and darkest where most exposed. There are several minor stripes between the major ones on the dorsal side, carrying out the scheme of countershading. A caudal spot is sometimes visible; mouth with red lines; peritoneum black. This fish has

distinct power to change shade, as is apparent when it passes from over corals to lighter bare bottom.

Brazil to Florida.

W. H. L.

Anisotremus virginicus (Linnaeus). PORKFISH

(Plate 2, figure 3; plate 16, figure 2)

Sparus virginicus Linnaeus, Syst. nat., 10th ed., 1758, p. 281—South America.

Pristipoma spleniatum Poey, Memorias, vol. 2, 1860, p. 187—Havana.

Rather uncommon. Found particularly about the coral stacks or other offshore haunts.

Stomachs of 6 individuals, taken at daybreak, were filled with ophiurans, mollusk shells, annelids, and fragments of crustaceans. Another taken before 9:00 A.M. contained a small fish and an annelid. On the contrary, 2 taken at 5:00 P.M. were empty, and no adults have been observed feeding by day, so it may be inferred that feeding occurs at night.

In an apparent feeding habit the young up to an estimated length of 150 mm. differ from adults. The smaller ones in particular are often seen nibbling and pecking at the surfaces of larger fishes, such as *Sphyræna barracuda*, *Kyphosus incisor*, *Lutianus griseus*, and *Caranx ruber*, presumably removing ectoparasites from the skins of their hosts, but the stomach of an individual examined yielded nothing I recognized as belonging to parasitic species.

Young fish show a color pattern different from that of the adult. They are yellow over the head and back and grow grayer below. On the side are two dark longitudinal stripes, the upper at a level higher than eye and running concurrently with base of dorsal, the lower passing through eye to base of caudal, ending in a black dumbbell-shaped spot. It was to such young fish as these that Poey gave the name *Pristipoma spleniatum*.

In fish 75 mm. long, the adult coloration is sometimes developed. The pattern is shown in plate 16, figure 2. The longitudinal dark stripes have become rather vivid yellow; fins yellow; the light interspaces between yellow lines blue; two bands on the head black; ocular bar of the width of pupil, the part of the iris before and behind it being yellow like the rest of the head.

This is one of the species illustrated in reproductions from autochrome photographs in the *National Geographic Magazine*, volume 51, January 1927. The plate (XIII) showing it has been retouched, by someone who clearly did not know this fish in the flesh. The ocular black stripe so effectively concealed the eye that the plate was regarded as defective, and the little yellow, which is all that really shows in advance of the black band through the eye, has been extended slightly and a supernumerary eye painted in.

Brazil to Florida.

W. H. L.

Anisotremus surinamensis (Bloch)

Only a few very large individuals and a single smaller one were seen. The large ones were observed about the greatest coral heads. The smaller fish was at the rocky shore north of the east lighthouse dock.

All these were gray with dark fins and a broad dark band about the fore part of the body. But the species is changeable, as its dark girdle may be wholly suppressed, leaving it gray in color.

Brazil to Florida.

W. H. L.

Family SPARIDAE. PORGIES

Calamus Swainson, 1839

The species of this genus are closely related and imperfectly known. Dr. Longley found great difficulty in identifying the specimens observed at Tortugas, and accordingly undertook a study of the genus by examining many specimens in American and European museums. Although he did not complete the study, he apparently reached certain more or less definite conclusions, which it seems desirable to report even though some of them do not apply directly to species found at Tortugas.

So far as I am able to judge from his notes and manuscript, Dr. Longley came to the conclusion that he took only two species at Tortugas. One he certainly identified as *Calamus calamus*. Concerning the other one I am less certain. According to notations made in his copy of Jordan, Evermann, and Clark's *Check list* (1930), however, and a pencil note over the account prepared for this species, I judge he intended to call it *C. bajonado*. For the recognition of these species certain differences in color, profile, and relative size of dorsal and anal spines seem important.

The collection contains specimens of various sizes. Though they differ considerably in color, I am unable to separate the preserved material on the basis of the differences given by Dr. Longley. The adults certainly appear to be *C. calamus*, and at least some of the younger ones also seem to be of that species.

The synonymy given under *C. calamus* includes *C. macrops* (Poey, Ann. Lyc. Nat. Hist. New York, vol. 10, 1872, p. 181—Havana, Cuba) and *C. kendalli* Evermann and Marsh (Rept. U. S. Fish Comm., pt. 25, 1899 (1900), p. 354—Puerto Rico), which have been considered good species in some recent works. On the other hand, Dr. Longley extracted *Pagellus orbitarius* Poey (Memorias, vol. 2, 1860, p. 201—Cuba) from this synonymy, as often given, and assigned it to the synonymy of *Pargus quadrituberculatus* Ranzani (Nov. com. Acad. sci. inst. Bonon., vol. 5, 1842, p. 348, pl. 32—Brazil). To the synonymy of this last-mentioned species he referred also *C. pennatula* Guichenot (Mem. Soc. sci. nat. Cherbourg, vol. 14, 1868, p. 116—Martinique).

Concerning *C. quadrituberculatus* Dr. Longley said: "In museum collections this is confused often with *Calamus calamus*, often with *Calamus penna*. Once recognized, *C. quadrituberculatus* is readily distinguishable. *Calamus proridens* is the only sort from which its segregation should offer difficulty except when the fishes are very small.

"Except from the species last mentioned its dentition sets it apart. A pair of superior canines, which in the adult become distinctly larger than the others and are then obliquely antrorse, from a very early stage are slightly enlarged and project downward beyond the rest in the outer series. These others with which

they are here contrasted are characteristically slight, scarcely enlarged basally before relatively advanced growth stages.

"Scales in lateral line to base of the caudal 54 or 55; pectoral rays almost invariably 14; width between tips of preorbital processes of frontal bone moderate, much less than in *C. calamus* of the same length, the processes themselves rather sharp distally, not vertically expanded and blunt as in that species; cheek streaked with horizontal lines, enclosing no rounded spots of the light ground color; the lines often wanting in preserved specimens."

In the Musée d'Histoire Naturelle, Paris, Dr. Longley examined the type specimens (no. 5564) of *Pagellus penna* Cuvier and Valenciennes (Hist. nat. poiss., vol. 6, 1830, p. 209—Brazil). Concerning these Dr. Longley noted: "They are the types of *Pagellus penna* and include two species. Two are those upon which the description of *P. penna* is largely or exclusively based. The third specimen belongs to a species for which the earliest name available appears to be *Pargus quadrituberculatus*."

The proportions and enumerations given, copied from Dr. Longley's notes, are based on the 2 type specimens of *C. penna*, having a total length of 137 and 147 mm. and a standard length of 106 and 116 mm.: Head 3.2, 3.4; depth 2.35, 2.4; snout to preopercular border 4.3, 4.5. Eye in head 3.3, 3.1; interorbital 3.9, 3.6; preopercular width 3.9, 3.6. Scales about 47, about 46; pectoral rays 15, 15.

From the synonymy of *C. penna*, as given in some current works, Dr. Longley extracted *Pagellus microps* Guichenot (in Ramon de la Sagra, Hist. Île Cuba, 1853, p. 188, pl. 3, fig. 1—Havana). To the synonymy of *C. microps* he assigned *Grammateus medius* Poey (Ann. Lyc. Nat. Hist. New York, vol. 10, 1872, p. 183, pl. 7, fig. 4—Havana), and *C. arctifrons* Goode and Bean (Proc. U. S. Nat. Mus., vol. 5, 1882 (1883), p. 425—Pensacola, Florida).

That Dr. Longley's findings, as set forth, were intended to be final I cannot be positive. They seem well worthy of consideration, however, when further studies are made.

S. F. H.

Calamus calamus (Cuvier and Valenciennes). SAUCER-EYE PORGY

(Plate 17, figure 1)

Pagellus calamus Cuvier and Valenciennes, Hist. nat. poiss., vol. 6, 1830, p. 206, pl. 152—Martinique; Santo Domingo.

Calamus megacephalus Swainson, Nat. hist. classn. fishes, vol. 2, 1839, p. 222 (after Cuvier and Valenciennes).

Calamus macrops Poey, Ann. Lyc. Nat. Hist. New York, vol. 10, 1872, p. 181, pl. 7, fig. 3—Havana (juvenile).

Calamus kendalli Evermann and Marsh, Rept. U. S. Fish Comm., pt. 25, 1899 (1900), p. 354—Mayaguez, Puerto Rico; Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 201, fig. 59.

?*Calamus arctifrons* Jordan and Thompson (not of Goode and Bean), Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 243—Tortugas, Florida.

The young of 55 mm. and over may be seined in *Thalassia* in shallow water, and larger young of 70 to 160 mm. occur in the 11-fathom channels. The adults are generally distributed over the open reef.

They feed by day. Crabs and many other forms are included in their dietary. They are always interested in the possibilities that arise with the overturning of a stone, and hence, within limits, may be enticed into any desired surroundings.

The species is very changeable in coloration. It usually was seen on the reef in a gray phase with a yellow wash from the snout to the fore part of the dorsal. The eye is wholly yellow except for a black bar of the width of the pupil extending vertically across it. Over bare sand or white rocky bottom the yellow may be almost entirely suppressed. Over bottom covered with brown algae the fish is olivaceous. It was occasionally seen in a banded phase, sometimes on the bottom, sometimes above gorgonians. Fish which had stopped to feed and fish resting in tanks sometimes showed it too. It includes an ocular stripe and six or seven others crossing the body behind it.

The young differ sufficiently from older fish to make it necessary to have a series of graded sizes before it is possible at first to associate the two. The young lack the net of blue about golden spots on the cheek, which readily identifies them later. The yellow wash they display in some phases is not so definitely anterodorsal as it becomes with age, and their profile is not steep enough to betray them.

Blue markings on the head include a suborbital line, a horizontal preorbital line, two rows of blue spots crossing the interorbital, a narrow blue line crossing nape, and sometimes a blue line along base of dorsal fin. All these may be suppressed. The smallest fish have three definite dark crossbars on ventral fin, later becoming irregularly marked, and the body may be much speckled with small dark dots.

Without the young of other species for comparison it is impossible to know which juvenile characters are specific, but the proportionate lengths of 1st dorsal and 3d anal spines seem to remain fairly constant and to resemble those of the adult *Calamus calamus* rather than those of *C. bajonado*.

Atlantic coast of tropical America to Florida and sometimes to North Carolina.

W. H. L.

Calamus bajonado (Bloch and Schneider). GRASS PORGY

This fish may be seen not infrequently in schools of up to a dozen in the neighborhood of the greater coral patches far up Loggerhead reef, also halfway to the reef off the Laboratory dock, as much over sandy bottom as over grass. I also observed a small school feeding by day on sand near a grassy bank off the west shore of Loggerhead Key.

In feeding, it takes much sand in its mouth and rejects the greater part of what has been taken.

Its profile is much more evenly rounded than that of *Calamus calamus*, and it reaches a larger size.

Its coloration is changeable. I recognize three phases. The commonest is a combination of gray and yellow about like that of *C. calamus*, but differently distributed. In the latter the yellow is anterodorsal, fading out posteriorly and ventrally. In *C. bajonado* it is dorsal, fading out ventrally. The second phase is clear gray, and is shown over clear sand, certainly if the fish is near bottom. The

third is a banded phase displayed when the fish were feeding near a grassy bank or other dark object, but it is not to be associated with the act of feeding primarily, for members of the same school feeding over clear sand showed it very faintly or not at all.

West Indies to Florida.

W. H. L.

Lagodon rhomboides (Linnaeus). PINFISH

A floating fish, 250 mm. long, nearly dead, which frigate birds were attempting to pick up is the only mature specimen seen, though the young to 75 mm. were not rare on the grass flats.

The fish have a relatively uniform as well as a strongly banded phase. In the former the body is striped with alternating bluish and brassy lines. The transition to the latter, so far as I know it as shown in aquarium tanks at night, is accomplished by contracting the chromatophores in corresponding parts of the darker series and so interrupting them, while at the same time the dark nuclei so formed are knit together in vertical series by the expansion of others in the pale areas between. The chief dark bars so originating are an interorbital, occipital, and humeral, with five others.

W. H. L.

That the adults, at least, are comparatively rare at Tortugas is surprising, as it is a very numerous fish about the wharves and along the shores at Key West.

Massachusetts to Texas.

S. F. H.

Diplodus holbrookii (Bean). SPOT-TAIL PINFISH

(Plate 17, figure 2)

Neither common nor widely distributed. One or more small schools may usually be found along the rocky shore on the east side of Loggerhead Key, and on a bank in the upper of the deep holes in the flats within Bird Key reef. The fish are found rarely in small numbers about coral stacks on the reef.

The alimentary tract of one specimen examined contained much *Thalassia*.

The almost universal color phase is a gray one, countershaded, with a circular black spot covering the anterior half of the caudal peduncle. The coloration is changeable, however, as fish feeding on algae over dark bottom were darker than when over clear sand. At night a pattern of vertical lines is shown. W. H. L.

To the foregoing preliminary account by Dr. Longley, a later field note may be added: "Young coming to feed about broken sea urchin showed a pattern of transverse dark lines, which has been referred to as a night color. This color flashed on and off; a transient phase, which most of the fish did not show."

Concerning its habitat Dr. Longley noted: "Found on reef in company with *Anisotremus virginicus*, *Lutianus griseus*, *Haemulon sciurus*, *H. parra*, and an occasional school of large *Sparisoma radians*." Again he observed, "Moving freely among snappers." Another time he wrote, "One with many snappers and other fish about coral head, East Key."

Florida Keys to Virginia.

S. F. H.

Archosargus probatocephalus (Walbaum). SHEEPSHEAD

This species is not mentioned in Dr. Longley's notes as occurring in the Tortugas. Therefore, he evidently did not observe it there, and Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 243) apparently did not have specimens from Tortugas, as they merely stated, "Reported to occur."

As this sheepshead is taken at Key West, though not common there, it might be expected at Tortugas. Its relative *Archosargus unimaculatus* (Bloch) is more commonly taken at Key West. Therefore, this species, too, may be expected in the Tortugas.

Texas to Cape Cod, rarely straying as far as Bay of Fundy.

S. F. H.

Family KYPHOSIDAE. RUDDER FISHES

Kyphosus Lacépède, 1802

The distinguishing characters of the two local species of rudder fish may be most conveniently set forth in a key.

S. F. H.

KEY TO THE SPECIES

- a. Depth 2.1 to 2.3; scales 55 to 57 (counted below lateral line); D. $XI, 12\frac{1}{2}$, sometimes $XI, 13\frac{1}{2}$; A. $III, 11\frac{1}{2}$, sometimes $III, 12\frac{1}{2}$; gill rakers 16 to 18; yellow streaks along rows of scales, if present, scarcely darker than straw yellow *sectatrix*
- aa. Depth 2.3 to 2.6; scales 62 to 65 (counted below lateral line); D. $XI, 14\frac{1}{2}$, sometimes $XI, 13\frac{1}{2}$; A. $III, 13\frac{1}{2}$, occasionally $III, 12\frac{1}{2}$; gill rakers about 22; yellow streaks along rows of scales brassy yellow . . . *incisor*

Kyphosus sectatrix (Linnaeus). WHITE CHUB

Perca sectatrix Linnaeus, Syst. nat., 12th ed., 1766, p. 486—Carolinas (a correction, misprinted *soltatrix* in 10th ed.).

Kyphosus metzelaari Jordan and Evermann, Proc. Calif. Acad. Sci., ser. 4, vol. 16, 1927, p. 506—Curaçao; Venezuela.

Only an evidently unfinished account has been found. The following is compiled from it and from field notes and a table of measurements and counts.

The schooling places of this fish differ from those of *Kyphosus incisor*, being found along ledges of beach rock off Loggerhead Key, about the Laboratory wharf, in and about the large coral stacks off Bird Key, and around the *Palythoa*-covered ledges off Bush Key.

It is chiefly if not wholly herbivorous, feeding on the bottom and on floating *Sargassum*.

In shade it is changeable, being darker under corals and gorgonians than when resting in the open. It sometimes displays a checkered pattern like the yellow chub. A fresh specimen 143 mm. long is described in field notes as follows: "Coloration paler than *incisor*, with a yellow horizontal line from upper tip of maxillary nearly to margin of preopercle; yellow lines on sides between rows of scales not quite as wide as interspaces; a white line across nape; a yellow spot

behind eye, and other minor yellow markings on head; basal half of pectoral more or less silvery; opercular border black."

The following measurements and enumerations are based on 11 specimens, ranging in length from 134 to 255 mm., standard length 110 to 205 mm.: Head 3.3 to 3.5; depth 2.1 to 2.3. Eye in head 3.0 to 3.3; snout 2.9 to 3.3; interorbital 2.4 to 2.9. D. XI, $12\frac{1}{2}$ or $13\frac{1}{2}$; A. III, $11\frac{1}{2}$ or $12\frac{1}{2}$; scales below lateral line 55 to 57.

That Dr. Longley regarded *K. metzelaari* as a synonym of this species was indicated in his copy of Jordan, Evermann, and Clark's *Check list*.

Atlantic coast of tropical America, straying northward to Cape Cod; supposedly occurring also in the eastern Atlantic. S. F. H.

Kyphosus incisor (Cuvier and Valenciennes). YELLOW CHUB

Pimelepterus incisor Cuvier and Valenciennes, Hist. nat. poiss., vol. 7, 1831, p. 198—Brazil.
Pimelepterus flavolineatus Poey, Repertorio, vol. 1, 1866, p. 319—Havana.

This fish schools year after year at the same spots, such as the coral stacks off Loggerhead bank, other great heads in 2.5 fathoms, a rugged bit of ancient submerged shore line off the Laboratory wharf, and an old wreck off Loggerhead Key.

It feeds chiefly on algae, including much *Sargassum*.

Its pattern is one of alternately blue and brassy yellow streaks, with the former occupying the median position on the scale rows; head with a subocular pale streak half the width of pupil, bounded by yellow; a dash of yellow above, before, and behind eye; a firm line from angle of mouth almost to preopercular border; pectoral basally faintly tinged with the yellow. In an alternative pattern conspicuous light spots appear on a dark ground, commonly shown by fish that are chasing others.

A figure drawn for Jordan and Evermann (Bull. U. S. Nat. Mus., No. 47, pt. 4, 1900, fig. 559) and published by error as *Kyphosus sectatrix* has been republished under the same name by Evermann and Marsh (Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 212, fig. 63). The specimen drawn (U. S. Nat. Mus. no. 20635) is clearly *K. incisor*. Its measurements and proportions are as follows: Standard length 157 mm., depth 64 mm. (2.45), head 40 mm. (3.92), eye 11 mm. (3.63 in head), interorbital width 16 mm. (2.5). D. XII, $13\frac{1}{2}$; A. III, $12\frac{1}{2}$; gill rakers 22. W. H. L.

The following proportions and enumerations are from a table found among Dr. Longley's papers, based on 12 specimens, 150 to 285 mm. long: Head 3.6 to 4.2; depth 2.3 to 2.6. Eye in head 3.3 to 3.9; snout 3.0 to 3.5; interorbital 2.3 to 2.7. D. XI, $13\frac{1}{2}$ or $14\frac{1}{2}$; A. III, $12\frac{1}{2}$ or $13\frac{1}{2}$; scales 62 to 65 (counted below lateral line).

Atlantic coast of tropical America.

S. F. H.

Family GERRIDAE. MOJARRAS

In the west Atlantic Gerridae, at least, the first two interhemal bones are fused to form a single support for the corresponding anal spines. What part is played

by each of the united elements may be made out by noting the relation the ridges on its sides bear to the articular surfaces, and by examining interhemals next in series. It becomes clear then that although one might say that in some of these fishes the second interhemal is long and spear-shaped, it is never correct to state that that bone is "expanded into a hollow cylinder into which the air bladder enters."

In *Gerres cinereus*, for example, the morphological first interhemal is essentially a flat plate, which is united along its posterior margin to the laterally expanded, long, tapering second interhemal. Its free anterior border is more or less thickened, without trace of excavation, and in cross section at mid-length is simply rounded.¹

Species here referred to *Eucinostomus* agree in having the anterior border of the first interhemal broad and concave in cross section at mid-length. Besides differing in details later mentioned, they are unlike in the extent to which, toward the articular end, the borders of this hollow element grow toward one another to enclose the tip of the air bladder.

W. H. L.

Eucinostomus Baird and Girard

Eucinostomus Baird and Girard, Smithsonian Inst. 9th Rept., 1854, p. 344 (*E. argenteus* Baird and Girard).

Ulaema Jordan and Evermann, in Jordan, Proc. Calif. Acad. Sci., ser. 2, vol. 5, 1895, p. 471 (*Diapterus lefroyi* Goode).

An incorrect idea regarding the structure of the falsely called "second interhemal" furnished Jordan and Evermann (see citation above), as Parr (Bull. Bingham Oceanog. Coll., vol. 3, art. 4, 1930, pp. 61-66) observed, with a generic difference in *Eucinostomus lefroyi* which is fancied only. At first glance the simplest of these interhemal structures might seem to be that of *E. havana*, for in it the hollow bone, receiving the tip of the air bladder, is widest open anteriorly. But in its sculpturing toward the articular extremity it is more complex than in *E. lefroyi*. It shows two pairs of ridges, an anterior and a lateral pair, whereas the species last named has only one pair of ridges. This single pair continues dorsally close together but not in real union, and forms the conical receptacle, slit open on the anterior side, in which the tip of the air bladder rests.

Though narrow, the anterior fissure is evident in the other species of *Eucinostomus* here considered. In two of the three species available for dissection, however, greater complexity of structure is attained; in these both anterior and lateral ridges appear to have grown forward to enclose the bladder tip, for the investing bone has an outer and a delicate inner lamina on either side of the median fissure.

W. H. L.

¹ *Gerres* is characterized, furthermore, by the peculiar swim bladder, which is bifurcate both anteriorly and posteriorly (Meek and Hildebrand, Field Mus. Nat. Hist., Zool. Ser., vol. 15, 1925, pt. 2, p. 590; Parr, Bull. Bingham Oceanog. Coll., vol. 3, art. 4, 1930, p. 64). In *Eucinostomus*, at least in *californiensis*, the air bladder tapers posteriorly and ends in a sharp point. Anteriorly it has two small appendages (Meek and Hildebrand, *op. cit.*, p. 585). —S. F. H.

Dr. Longley described a new species, which he named *E. poeyi* (Carnegie Inst. Wash. Year Book No. 34, 1935, p. 88). This species, the type of which is from Cuba and is deposited in the Museum of Comparative Zoölogy (no. 22014), was not taken at Tortugas, and for that reason is not included here, except for the present mention. Dr. Longley reported its range as extending from Texas to Panama, Cuba, Haiti, Curaçao, and Trinidad. He reported it to differ from *E. gula* and *E. argenteus* in having 8 instead of 7 gill rakers, and in having a definitely white subterminal bar below the black tip of the dorsal instead of a mere pigmentless area; from *E. argenteus* in the decidedly deeper body; and from *E. gula* in having the premaxillary groove open. S. F. H.

KEY TO THE SPECIES¹

- a. Anal fin with only 2 spines; interhemal bone with compressed funnel, with more or less of a slit anteriorly, enclosing tip of swim bladder . . . *lefroyi*
- aa. Anal fin with 3 spines
 - b. Interhemal bone with a large funnel, enclosing the swim bladder for a comparatively long distance
 - c. Premaxillary groove closed anteriorly by scales; body usually rather deep, depth often 2.2 to 2.4 *gula*
 - cc. Premaxillary groove open and linear, not crossed by scales in front; body usually more elongate, depth about 2.6 to 3.1; pectoral fin not covered with scales *argenteus*
 - bb. Interhemal bone broad, expanded into a pair of lateral ridges, forming a spoon-shaped depression in front, entered by tip of swim bladder; body rather slender, depth about 2.7 to 3.0; premaxillary groove narrow, sometimes nearly closed in front; pectoral fin densely covered with scales *havana*

Eucinostomus lefroyi (Goode)

Diapterus lefroyi Goode, Amer. Jour. Sci. and Arts, ser. 3, vol. 8, 1874, p. 123—Bermuda.

Eucinostomus productus Poey, Enumeratio, 1875, p. 55—Havana.

Eucinostomus meeki Eigenmann, Bull. U. S. Fish Comm., vol. 22, 1902 (1904), p. 229, fig. 10—San Juan River, West Cuba.

Examples 125 to 150 mm. long occurred along sandy beaches, and the young were common in the shallows about Long Key and inside Bird Key reef.

An annelid skin, copepods, and perhaps remains of other crustaceans comprised the contents of one stomach examined.

Two fish were noticed pushing each other with open mouths, as species of *Haemulon* commonly do.

West Indies to Florida and Bermuda.

W. H. L.

¹ The key is adapted from Dr. Longley's discussion, from my own studies, and from Parr (Bull. Bingham Oceanog. Coll., vol. 3, art. 4, 1930, pp. 61–66, fig. 13). Too much reliance should not be placed on the statements concerning the preorbital groove and the depth of the body. Having studied many specimens, especially of the group with the large funnel-shaped interhemal bone, here referred to *E. gula* and *E. argenteus*, collected in Panama, Key West (Florida), and Beaufort (North Carolina), I know that great variation exists and that some specimens are extremely difficult to identify by these characters.—S. F. H.

Eucinostomus gula (Cuvier and Valenciennes)

Gerres gula Cuvier and Valenciennes, Hist. nat. poiss., vol. 6, 1830, p. 464—Martinique.

Diapterus (species dubia) Poey, Repertorio, vol. 2, 1868, p. 324—Havana.

Eucinostomus gulula Poey, Enumeratio, 1875, p. 54, pl. 2—Havana.

Diapterus homonymus Goode and Bean, Proc. U. S. Nat. Mus., vol. 2, 1879, p. 340—Clear-water Harbor, Florida.

The types of *Gerres gula*, collected by Plee in Martinique, are 2 fish of which the proportional measurements are given (first) in table 6. They are representatives of a species usually distinguishable by having a scaleless pit over the tips of

TABLE 6

MEASUREMENTS (IN MILLIMETERS) OF 7 SPECIMENS OF *Eucinostomus gula*, THE FIRST 2 BEING THE TYPE SPECIMENS

(The figures in parentheses in the third and fourth columns show the number of times the depth and head, respectively, are contained in the standard length. Those in the last column show how many times the eye is contained in the head.)

Total length	Standard length	Depth	Head	Eye
123	96	42 (2.3)	31 (3.1)	11.0 (2.8)
121	94	39 (2.4)	29 (3.2)	10.0 (2.9)
95	70	32 (2.2)	23 (3.0)	8.0 (2.9)
95	69	31 (2.2)	22 (3.1)	7.5 (2.9)
96	67	30 (2.2)	22 (3.1)	7.5 (2.9)
91	67	31 (2.2)	22 (3.1)	7.5 (2.9)
83	62	28 (2.2)	21 (3.0)	7.5 (2.8)

the premaxillary processes, rather than a scaleless premaxillary groove open anteriorly, as in *Eucinostomus argenteus* and some if not all the other species of the genus.

In the museums it is not uncommon to find *Eucinostomus gula* and *E. argenteus* confused. But even if scales in the critical region are lost, or if individual variation produces intermediates as to squamation, as it possibly does, the two (quite independently of differences in proportions) are still separable by slight but constant differences in the structure of the functional first interhemal. For example, in proportion to its length the diameter of the interhemal cavity is much greater in *E. gula* than in *E. argenteus*, and, furthermore, the ridge from the articular extremity of the second interhemal (morphologically speaking) runs laterally in the former, rather than posterolaterally as in the latter species, on the composite first and second, and does not continue so far from its origin as an evident ridge.

Atlantic coast of tropical America, sometimes straying northward to Cape Cod.

W. H. L.

***Eucinostomus argenteus* Baird and Girard**

Eucinostomus argenteus Baird and Girard, Smithsonian Inst. 9th Rept., 1854, p. 345—
Beesley's Point, New Jersey.

Eucinostomus pseudogula Poey, Enumeratio, 1875, p. 53, pl. 1—Cuba.

Gerres jonesii Günther, Ann. and Mag. Nat. Hist., ser. 5, vol. 3, 1879, p. 150—Bermuda.

The young were commonly caught with the seine about Long Key and the flats inside Bush Key reef, and a few were found in the moat at Fort Jefferson.

In a common color phase *Eucinostomus argenteus* is olive-buff dorsally with four half-bands of smoke gray on upper part of side. Except for very vague blotches and a few interrupted dusky lines along the scale rows, there is no pattern on the silver side below the lateral line. At times the bars disappear and the fish is merely freckled with small spots of the darker color. The margin of the dorsal fin is dusky, particularly anteriorly. With change in only minute detail this description applies to the other Tortugas species of the genus.

Table 7 gives the comparative measurements of 15 specimens of *E. argenteus*.

TABLE 7

MEASUREMENTS (IN MILLIMETERS) OF 15 SPECIMENS OF *Eucinostomus argenteus*

(The figures in parentheses in the third and fourth columns show the number of times the depth and head, respectively, are contained in the standard length. Those in the last column show how many times the eye is contained in the head.)

Total length	Standard length	Depth	Head	Eye
165	127	47 (2.7)	39 (3.3)	14 (2.8)
147	113	43 (2.6)	35 (3.2)	13 (2.7)
145	109	40 (2.7)	33 (3.3)	13 (2.5)
141	108	41 (2.6)	34 (3.2)	13 (2.6)
137	104	40 (2.6)	33 (3.2)	12 (2.8)
112	83	28 (3.0)	28 (3.0)	9.0 (3.1)
100	73	25 (2.9)	25 (3.0)	8.0 (3.2)
93	68	23 (3.0)	23 (3.0)	8.5 (2.7)
90	62	22 (2.8)	22 (2.8)	8.0 (2.8)
83	65	21 (3.1)	21 (3.1)	8.0 (2.6)
80	60	20 (3.0)	20 (3.0)	7.0 (2.9)
80	59	21 (2.8)	20 (3.0)	7.5 (2.7)
69	51	19 (2.7)	18 (2.8)	6.0 (3.0)
53	40	15 (2.7)	14 (2.9)	5.0 (2.8)
51	36	14 (2.6)	14 (2.6)	5.0 (2.8)

The table shows that this is a slighter fish than *E. gula*, one in which the depth equals the head instead of materially exceeding it. The last dorsal spine is shorter than in *E. gula*, entering about twice, rather than one and one-third times, into the length of the 1st soft ray. The dorsal fin, as a result, is much more deeply notched in *E. argenteus* than in *E. gula*.

Atlantic coast of tropical America, sometimes straying northward to North Carolina.

W. H. L.

Eucinostomus havana (Nichols)

Xystaema havana Nichols, Bull. Amer. Mus. Nat. Hist., vol. 31, 1912, p. 189, fig. 2—Havana.

Eucinostomus mowbrayi Beebe and Tee-Van, Zoologica, vol. 13, 1932, p. 115—Bermuda.

At least a few may often be found off the eastern side of the Laboratory in the partial shelter of a ledge of coquina. Nothing more is required to bring together such as are near than to wade out into the water a little more than waist deep and stir up sand, which calls them to feed. With them comes *Eucinostomus lefroyi*. The young were taken sometimes with those of *E. lefroyi* and *E. gula* in shallow water about Long Key and inside Bird Key reef.

This species is very rare in museums, and in only one instance were specimens discovered under false labels. The type of *E. mowbrayi*, from Bermuda, appears to differ only in the proportions of its 2d and 3d anal spines, and probably represents no more than an individual variation.

W. H. L.

Measurements and counts of 4 specimens, ranging in length from 135 to 165 mm. (standard length 105 to 126 mm.), are summarized as follows: Depth 2.7; head 3.2 to 3.3. Eye in head 2.8 to 3.0. D. IX, 10½; A. III, 7½; scales 46 to 48, in four complete rows between lateral line and base of 1st dorsal spine.

As this species and *E. argenteus* are very similar in external appearance, and as the color of preserved specimens appears to be identical, it seems desirable to mention a difference that does not seem to have been published, namely, that in *E. havana* the pectoral fins are densely covered with scales (at least in adults), whereas in *E. argenteus* they have at most only a few scales at the base. No exceptions were found among a dozen or more specimens of each species examined.

Apparently a rather rare species, recorded from Brazil, Cuba, Florida, the Bahamas, and Bermuda.

S. F. H.

Gerres cinereus (Walbaum). MOJARRA BLANCA

Mugil cinereus Walbaum, Artedi pisc., pt. 3, 1792, p. 228—Bahamas (after Catesby).

Gerres aprion Cuvier, Règne animal, 2d ed., vol. 2, 1829, p. 188 (based on Catesby).

Gerres zebra Müller and Troschel, in Schomburgk, Hist. Barbados, 1848, p. 668—Barbados.

Gerres squamipinnis Günther, Cat. fish. Brit. Mus., vol. 1, 1859, p. 349—Jamaica; Guatemala.

This fish haunts sandy beaches, and may frequently be seen resting a few inches above the bottom.

From the stomach of one fish were obtained the remains of a large worm, and much sand and debris.

Except for the dusky or dark-tipped caudal and the yellow ventrals, the color pattern of this species presents, on a countershaded body, a combination of tones of gray such as appear on the bottoms it frequents. It is faintly or irregularly banded, more distinctly in young than in older fish.

Both coasts of tropical America, ranging northward on the Atlantic to Florida.

W. H. L.

Family MULLIDAE. SURMULLETS OR GOATFISHES

Dr. Longley (Carnegie Inst. Wash. Year Book No. 34, 1935, p. 283) stated: "Species Jordan, Evermann and Clark (*Check List*, 1930, 343) refer to as *Upeneus maculatus*, *U. martinicus* and *U. parvus* are no two of them congeneric." In the accounts that follow Longley placed the first species mentioned in the genus *Pseudupeneus*, the second in *Mulloidichthys*, and the third in *Upeneus*.

This generic classification clearly was based on differences in dentition, which Dr. Longley described in detail for two of the local genera (and species), but not for the third one. In the key to the genera the description of the teeth of *Mulloidichthys* was inserted by me with only a few specimens in hand. These descriptions of the other genera are Dr. Longley's accounts, which were checked, however, against specimens from Tortugas. S. F. H.

KEY TO THE GENERA

- a. No teeth on vomer or palatines
 - b. Teeth in jaws anteriorly in three series, reduced to two laterally and to one posteriorly, all small and bluntish *Mulloidichthys*
 - bb. Teeth in jaws uniserial in young, in adults (200 mm. or more in length) with extra projecting anterolateral canines above main row *Pseudupeneus*
- aa. Teeth on vomer and palatines; a single row laterally on upper jaw, two or three rows anteriorly, and three or four posteriorly on lower jaw *Upeneus*

Mulloidichthys martinicus (Cuvier and Valenciennes). YELLOW GOATFISH

(Plate 18, figures 1, 2)

Upeneus martinicus Cuvier and Valenciennes, Hist. nat. poiss., vol. 3, 1829, p. 483—Martinique.

Upeneus flavo-vittatus Poey, Memorias, vol. 1, 1853, p. 224—Cuba.

Mulloidichthys martinicus Longley, Carnegie Inst. Wash. Year Book No. 34, 1935, p. 283.

In marked contrast with the red goatfish, the yellow one is usually found about coral stacks passing the day in idle schools. True, an occasional fish may be seen during daylight searching desultorily in the sand for food with its barbels, or even plowing in it with snout buried almost to the eyes. This activity, however, nets next to nothing, as appears from examination and comparison of stomach contents. Examples taken early in the morning almost invariably have their stomachs well filled with annelids, both sedentary and free living, together with crabs, small ophiurans, and an occasional small fish. In contrast with these, examples secured at 5:00 P.M. had no identifiable food in the alimentary tract.

Color yellow-olive, countershaded, with yellow dorsal fins and a yellow stripe narrowly margined with lighter color running from the pupil to the dorsal lobe of the caudal, where it expands to cover the entire fin. The pattern is permanent, but its shade is changeable, being much paler over sandy bottom near coral heads than among the heads themselves.

Known from Panama, West Indies, and Florida.

W. H. L.

Pseudupeneus maculatus (Bloch). RED GOATFISH

(Plate 19, figures 1, 2)

This fish is diurnal and appears to eat almost exclusively small animals it discovers by probing in loose sand with its sensitive barbels, in the smaller patches between coral stacks and *Thalassia*, and on alga- and gorgonian-covered bottom. Shallow water is its preferred habitat, but it goes down into the 10-fathom channels at Tortugas, and Poey reported it (Memorias, vol. 1, 1853, p. 224) from a depth of almost 30 fathoms.

It normally occurs singly, or in small groups of 4 or 5, and is commonly trailed by *Halichoeres bivittatus*, *Thalassoma* adolescents, and *Ocyurus*, which follow to secure darting crustaceans routed out but lost by the goatfish. The young, 50 mm. or so in length, are abundant in June. To the length of 125 mm. they are found occasionally in the waste of the tern rookeries.

Its popular name conveys a false impression, for it is markedly red only in death or as it comes from deep water. Living and moving about, as far down as it may be seen in shallow diving, it is usually in a sandy-gray phase with three squarish dark brown or black spots on the side. In *Thalassia* it is decidedly greenish. Its pattern is very changeable, however, and is altered almost immediately if the fish comes to rest on the bottom, when in extreme cases it may be strongly banded. Another phase frequently observed in the swimming young of about 75 mm. in dishes in the laboratory has not been observed on the reef; in this a sharply defined brown line runs from the snout through the pupil to the base of the caudal. The stripe tends to break or does break up into spots when the fish rests, and may become diffuse bands, as has been stated.

The stomach is little specialized in the direction so marked in *Mulloidichthys martinicus*. Its ascending limb is expanded a little, its walls are slightly thickened, and it bears 10 pyloric caeca on either side.

Jordan and Evermann (Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 858) stated that the teeth in the upper jaw are "uniserial, or occasionally irregularly biserial, with the outer teeth turned outward." It may be said more adequately, however, that at lengths exceeding 200 mm. *P. maculatus* regularly develops projecting, anterolateral curved canines above the main tooth row.

Atlantic coast of tropical America northward to Florida.

W. H. L.

Upeneus parvus Poey

South of Tortugas this fish was taken repeatedly in 40 to 60 fathoms. One haul yielded 11 specimens, the largest individual obtained being 220 mm. long.

The ground color of fresh specimens is reddish, spotted with yellow, and a yellow streak as wide as the pupil extends from upper margin of the gill cleft to base of caudal.

In more than 80 years, since its description by Poey, this species has been known only from his record, emended only by implication. Its teeth are small, and are present in both jaws. In the upper they are in a single row laterally, in the lower irregularly in two or three rows toward the symphysis and three or four

posteriorly; present also on vomer and palatines, on the former in a weak and sometimes incomplete series along the anterior border, and more aggregated toward the inferior margin on the latter. This dentition is thoroughly representative of the genus *Upeneus*, in the sense in which it seems that name must be accepted.

Known from Cuba and Tortugas, Florida.

W. H. L.

Family SCIAENIDAE. CROAKERS, DRUMS, ETC.

Odontoscion dentex (Cuvier and Valenciennes)

(Plate 20, figure 1)

Occasionally seen skulking under corals. Nowhere else as commonly found as in a patch of *Acropora* growing in 12 to 16 feet of water off the Laboratory dock.

Gray above, silvery below, with base of pectoral black.

Known from Trinidad, Panama, West Indies, and Tortugas.

W. H. L.

Menticirrhus americanus (Linnaeus)

Dr. Longley evidently did not find this species. It is included in the fauna of Tortugas on the authority of Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 244), who stated, "Taken by Dr. Henshall at Garden Key in 1889." It was not seen at Key West during several years of intermittent collecting by Bureau of Fisheries investigators.

Texas to New York.

S. F. H.

Menticirrhus littoralis (Holbrook)

This species is included here solely on the record by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 244), who reported one small specimen. Dr. Longley evidently did not see it there.

South Atlantic and Gulf coasts.

S. F. H.

Eques lanceolatus (Linnaeus)

Taken at a number of points in the 10-fathom channels within the group, and at 40 fathoms south of Tortugas. Five specimens 125 to 175 mm. long, taken from June to August, were females in breeding condition.

Ground color pale gray, slightly duskier along base of dorsal fin; vertical dark bar through eye as wide as pupil; other dark bands in pattern white-margined.

W. H. L.

The "other dark bands" mentioned consist of one passing downward from nape, curving backward, crossing opercle to base of ventral, then continuing on that fin and across chest; and a second one extending from tip of spinous dorsal to its base, then curving downward and backward on body and extending to tip of caudal, becoming horizontal posteriorly.

A juvenile, 31 mm. long, 15 mm. to base of caudal, was taken on July 20, 1938,

by Dr. Hugh H. Darby. This specimen apparently is the smallest on record. As is evident from the measurements given, the caudal fin slightly exceeds in length the rest of the fish, the produced part consisting principally of 3 median rays; first dorsal very high, and expanded distally, reaching mid-length of the produced caudal fin if laid back; ventrals also rather long, reaching a little past end of anal base; body behind base of first dorsal decreasing even more rapidly in depth and more slender than in adult.

The pattern of dark stripes is about the same as in adults. The first dorsal, however, is largely black, as it is pale only on basal three-fourth or four-fifths, the distal expanded part being wholly black. The ventrals, too, are largely black, and the black lateral band extends to tip of longest ray of caudal.

West Indies to Florida.

S. F. H.

Eques acuminatus (Bloch and Schneider)

(Plate 20, figure 2)

Though this species moves out at dusk, it usually ventures little beyond the shadow of its overhanging shelter by day. A diver finds it not uncommonly under the beach rock at Loggerhead, in the standing dead *Acropora* east of Bird Key harbor, and among shelves of stone in gorgonian thickets, or in caverned rocks at many points about the keys.

The faintly countershaded gray body is marked with a pattern of dark longitudinal stripes, variable in intensity. The fins of mature fish are largely dusky, but the spinous dorsal of the young is almost evenly divided between vertical bars of black and white.

This species, according to Townsend (13th Ann. Rept. New York Zool. Soc., 1909, reprint, p. 28), has a dark phase, "uniformly dusky brown on body and fins." This seems to account for *Eques acuminatus umbrosus* Jordan and Eigenmann (Rept. U. S. Fish Comm., pt. 14, 1886 (1887), p. 440), which is "essentially similar in form to the typical *acuminatus*, but with the color marks obscure." Townsend also stated that in the dark phase two or three dark blotches occasionally appear.

Atlantic coast of tropical America northward to the south Atlantic states.

W. H. L.

Eques pulcher Steindachner

This fish occurs in perhaps variable numbers from year to year. The young up to 50 mm. in length were rather common at times near the shadow beneath overhanging rocks along shore or in bare tracts in turtle grass offshore at Loggerhead Key and on Bird Key flats. They were not rarely seen about groups of the long-spined black sea urchin.

Under all observed conditions the ground color is pearl gray with three longitudinal stripes of dark brown or black on side. From the occiput, where it meets its fellow, the dorsalmost runs almost to end of soft dorsal, the next proceeds from anterior margin of eye across pupil, approximating its width, and thence to tip of caudal. The line last mentioned usually divides before the eye, its dorsal branch meeting its fellow across interorbital space, while the ventral converges

with the corresponding one of opposite side toward tip of the included lower jaw, which bears a dark spot. The third of the main longitudinal stripes is tangent to the eye below, and passes back below pectoral and above anal to lower face of caudal peduncle, lying close to but not fused with the stripe of the opposite side. The pectoral, ventral, anal, and caudal are black with white margins, and the dorsal is dark-margined and has a dark line below base in its anterior half. There are also several more or less distinct dusky vertical bars. The most definite is between base of spinous dorsal and ventral; another runs from a point before middle of soft dorsal to anal; and a third, narrower and fainter (sometimes wanting), is parallel with it from posterior point of trisection of soft dorsal. A definite line also passes down from eye to margin of gill cover. W. H. L.

This species was first recorded from Tortugas by Jordan (Jordan and Thompson, Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 244). It ranges from the West Indies to Florida. S. F. H.

Family MALACANTHIDAE. BLANQUILLOS

Malacanthus plumieri (Bloch)

A small fish from a deep hole inside Bird Key reef is believed to represent this species.

Its color was faint olive green above, pale bluish white below; dorsal and anal faintly olive; a black spot a little larger than pupil at base of upper caudal lobe, and in either lobe a dark streak. In the water the fish, except for its caudal spot and lines, was almost colorless. It swims with a sinuous motion. W. H. L.

A specimen 65 mm. long is included in the collection. In color it seems to agree with Dr. Longley's description, the black caudal spot and the dark streaks on the caudal fin remaining evident.

If this specimen belongs here, considerable variation must exist. I have obtained the following proportions and enumerations: Head 4.2; depth 6.8. Eye in head 3.2; snout 2.8; interorbital 3.75; maxillary 2.6; caudal peduncle 3.1; ventral 2.25; pectoral 1.6. D. 58 (the anterior 5 rays separate, which possibly may have resulted from an injury in life); A. 50; V. 15; P. 16 or 17; scales too small to enumerate accurately, about 185, ciliate, none on top of head, though present on cheeks and opercles. The gill membranes are somewhat connected across the isthmus; the opercular spine reaches the margin; no canine teeth developed.

West Indies, and now for the first time recorded from Florida. S. F. H.

Caulolatilus cyanops Poey

Two specimens, 120 and 225 mm. long, are included in the collection. Though there is no definite locality label with these fish, the smaller one probably is the specimen listed in Dr. Longley's notes, total length 125 mm., taken south of Tortugas in 30 fathoms.

I have compared the two fish from Tortugas with one, 380 mm. long, from Cuba, the type locality, and presumably identified by Poey. The specimens agree

well, except for such differences as might be expected between small and large examples within a species. The following proportions and enumerations are based on the 3 specimens examined, and are given in the order of size, beginning with the smallest. The numbers based on the Cuban example are enclosed in parentheses: D. VII,24, VII,23 (VII,24); A. I,22, I,23 (I,22); P. 17 (17); scales 12-105-26, 9-93-19? (11-108-24), counting longitudinal series above lateral line; gill rakers 12, 11 (11). Head 3.3, 3.5 (3.4); depth 3.5, 3.6 (4.1). Eye in head 3.1, 3.7 (3.8); snout 3.5, 2.6 (2.6); interorbital 4.2, 4.35 (3.5); maxillary 2.7 (2.75); caudal peduncle 3.3, 3.15 (3.8); pectoral 1.3, 1.1 (1.1); ventral 1.65, 1.4 (1.7).

The body is rather compressed; head deep; profile steep from tip of snout to interorbital, and only gently convex thence to dorsal; gill membranes connected across isthmus; vertical margin of preopercle distinctly serrate; opercle with a single flat spine; teeth in jaws anteriorly in bands, mostly in a single series laterally; a row of recurved canines in front on upper jaw and a smaller enlarged tooth directed somewhat forward posteriorly; a row of canines laterally in lower jaw; no teeth on vomer or palatines; scales small, strongly ctenoid, extending forward to interorbital space; none on fins except basal two-thirds of caudal; dorsal fin continuous, not notched; caudal distinctly lunate; anal long and co-terminal with dorsal; ventrals inserted very slightly posterior to base of pectorals, scarcely reaching vent; pectorals falcate, reaching vertical from origin of anal.

Color in spirits plain, slightly grayish above, pale below, the larger specimen with a black line from interorbital to origin of dorsal; fins plain straw color, except for a dark blotch on lower lobe of caudal in the smaller fish from Tortugas, wanting in the other specimens; a slight dusky spot in and above upper part of axil of pectoral.

Dr. Longley has the following on the color of a fresh specimen, presumably based on the smaller one:

"A yellow median streak from interorbital space down mid-line of back, the dorsal fin rising out of its midst. The fin itself mainly yellow at base, more broadly yellow at margin. Intermediate part of fin colorless except for faint duskiness toward the yellow above and below. The median yellow of back bounded by bright blue lines on side a little wider than row of scales, becoming median on caudal peduncle. Yellow and blue follow next in alternation, but so faint as to be scarcely discernible as lines. Interstitial region and eye above and below are bluish, with some yellow at intermediate level. Cheek slightly bluish, and caudal yellow, with dark posterior margin. A small black spot above axil of pectoral."

This species has been recorded only from Cuba and Puerto Rico, though a related species, *Caulolatilus microps*, is reported from off Pensacola, Florida.

S. F. H.

Family ANTIGONIIDAE

Antigonia capros Lowe

Five specimens, 75 to 177 mm. long, were taken between 90 and 140 fathoms. Reddish, with three crossbars of deeper red, the first as wide as pupil, running

from nape vertically through eye, across cheek, and thence just above ventral outline to base of and on ventral fin; the second wider, crossing body between first 3 dorsal spines and space between ventral axil and pectoral origin; the third just before base of caudal.

W. H. L.

In addition to the specimens listed, another one, 35 mm. long, is mentioned in Dr. Longley's notes. This small specimen was taken at a depth of 40 fathoms.

Fowler (Proc. Acad. Nat. Sci. Philadelphia, vol. 86, 1934, p. 356, fig. 8) recognized a new species, which he named *Antigonia browni*, based on a specimen 68 mm. long, taken off the coast of New Jersey in 70 fathoms. The 4 small specimens (40 to 67 mm. long) in Dr. Longley's collection agree well with Fowler's description and figure of *A. browni*. If *A. browni* actually is distinct from the cosmopolitan *A. capros* (which would seem to require the study of more and larger specimens for positive determination), the Tortugas material apparently should be referred to *A. browni*. The body is quite as deep in the Tortugas specimen as in the fish from New Jersey described by Fowler, but the pectoral is scarcely as long as represented in Fowler's figure. Fowler described and figured two dark crossbands, whereas Longley described three (in a specimen 75 mm. long), the one at the base of the caudal being missing in Fowler's specimen, as it is now in Longley's preserved specimens. It is possible, then, that in long-preserved material the other bands may fade also, which would remove one of the supposed differences. In the Tortugas specimens, as in the New Jersey fish, the 2d dorsal spine is proportionately much longer and stronger than shown in Goode and Bean's figure (Ocean. Ichthyol., 1895, p. 229, fig. 235), and scales are present on the interradiar membranes.

The following proportions and enumerations are based on the specimen that furnished the basis for Dr. Longley's color description: Head 2.6; depth 0.82; pectoral 2.4. Eye in head 2.85; snout 4.3; interorbital 3.9; longest dorsal spine 1.05. D. VIII,32; A. III,31; scales about 58, 4 rows on cheek.

Antigonia capros has been reported from deep water from many parts of the world.

S. F. H.

Family CHAETODONTIDAE. BUTTERFLY FISHES

Chaetodon capistratus Linnaeus

(Plate 20, figure 3)

Chaetodon capistratus Linnaeus, Syst. nat., 10th ed., 1758, p. 275—"India."

Chaetodon bricei Smith, Bull. U. S. Fish Comm., vol. 17, 1897, p. 102, fig.—Woods Hole, Massachusetts (young).

Occasional; singly, in pairs, and rarely more. Less common than *Chaetodon ocellatus*, more common than *C. striatus*. The young, of 25 mm., once were taken on the grass flats near Long Key or Bird Key reef. The adults are reef fishes; very frequently found about the greater coral heads.

Usually seen in a very pale olivaceous ground-color phase, with black ocular band, and ocellated black spot larger than the eye under the soft dorsal, occa-

sionally showing in addition a distinct humeral band, which appears regularly in the young. I have seen adults display it in a pail of water, and under natural conditions over dark, muddy bottom. The same mark appears at night in association with two dark stripes running back from it horizontally above and below the ocellus to meet a third stripe on the dorsal fin. The ocular stripe is sometimes almost black; sometimes pale olive of the exact shade of the head. It is darkest when the fish is feeding low down or in a shadow; lightest when highest up, or swimming rapidly over comparatively long distances. The ocular band is an interesting marking illustrated in detail in plate 20, figure 3. It differs in no significant respect from the corresponding marking of *C. ocellatus*, to which reference is made at length below.

As is suggested above, the young differ decidedly in appearance from the adults. Indeed, before the life history was known, the young were named *C. bricei*. They have a supernumerary humeral band, and a broad dusky area covering the soft dorsal and the body below, which includes the persistent ocellus of the adult and a smaller ephemeral one on the fin above it. W. H. L.

The collection contains 2 specimens, 39 and 68 mm. long. The rows of scales are arranged as in *striatus*, that is, those on upper half of side run upward and backward and those on lower half run downward and backward. However, *capistratus* has 13 dorsal spines, whereas *striatus* has only 12. Furthermore, the first-mentioned species has a persistent ocellus on the body under the posterior part of the dorsal fin, which is missing in *striatus*. The last-mentioned species, when young, also has an ocellus, but it is situated on the anterior rays of the soft dorsal.

Atlantic coast of Panama, Trinidad, West Indies, and sometimes northward to Cape Cod. S. F. H.

Chaetodon striatus Linnaeus

Chaetodon striatus Linnaeus, Syst. nat., 10th ed., 1758, p. 275—"India."

Chaetodon consuelae Mowbray, in Borodin, Bull. Vanderbilt Ocean. Mus., vol. 1, art. 1, 1928, p. 23, pl. 4, fig. 2—Cay Sal Banks, Bahamas, in 8 fathoms.

With the exception of *Chaetodon sedentarius*, this is the least common species of the genus in shallow water. Its preferred habitat seems to be bottom strewn with eroded corals only sparsely covered with algae.

Like many other Chaetodons, it has a dark ocular band, faintly margined with light color, not continued ventrally below opercular cleft; two broad brown bands, convex anteriorly, crossing body and vertical fins, the foremost meeting its fellow before vent, which is unusual, as such bands generally fade out before reaching the mid-line below; a third band, concave anteriorly, crossing base of caudal peduncle, fusing on dorsal and anal fins with preceding band. Young about 50 mm. in length with a well-developed ocellus on dorsal fin in the third band, disappearing in the adult; soft dorsal, anal, and caudal with a series of brown, blue, and yellow lines within their transparent margins.

Atlantic coast of tropical America, ranging northward to Florida and the Bahamas. W. H. L.

Chaetodon ocellatus Bloch

(Plate 21, figures 1, 2)

Chaetodon ocellatus Bloch, Naturgesch. ausland. Fische, vol. 3, 1787, p. 105, pl. 211, fig. 2—"East Indies."

*Chaetodon bimaculatus*¹ Bloch, *ibid.*, vol. 4, 1790, p. 9, pl. 209, fig. 1—"East Indies."

Sarothrodus maculocinctus Gill, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 99—Newport, Rhode Island (young).

The commonest species of the genus at Tortugas, frequently occurring in pairs, and sometimes in fours or fives. More apt to swim and feed over comparatively bare and sandy areas than the other species.

Young with black vertical band from soft dorsal to anal, not shown in mature ones, the band disappearing before the fish greatly exceeds 40 mm. in length. Adults with faint dusky spot beneath soft dorsal usually remaining; black ocular stripe, narrowly margined with yellow and of width of pupil, persisting and running from anterior base of dorsal fin to opercular cleft; ground color of body very light; soft dorsal, anal, and caudal yellowish with a submarginal blue line on anal and caudal; a black spot at angle of dorsal; ventrals yellow.

At night the dusky dorsal spot in both unconfined and confined fish stands out distinctly and a dark humeral band makes its appearance. This band varies from moment to moment, if a flashlight is turned on the fish. It appears sometimes broad and diffuse, sometimes clearly defined. The young also change at night, losing the posterior black bar and retaining only the spot which dimly or distinctly persists through life, and also showing white spots on the side.

W. H. L.

The Tortugas collection contains 5 specimens, ranging in length from 30 to 125 mm. In this species the rows of scales run obliquely upward and backward on the side, except below the level of the base of the pectoral, where they become horizontal.

Panama and Trinidad northward, sometimes to Cape Cod.

S. F. H.

Chaetodon sedentarius Poey

Chaetodon sedentarius Poey, Memorias, vol. 2, 1860, p. 203—Cuba.

Chaetodon gracilis Günther, Cat. fish. Brit. Mus., vol. 2, 1860, p. 20—Caribbean Sea; West Indies.

No account of this species was found among Dr. Longley's papers. The collection contains 4 specimens, 75 to 99 mm. long, and 6 are listed in his notes, the largest of which was 115 mm. long. One of the latter was taken in 2½ fathoms and the others in 40 fathoms.

A preserved specimen, 75 mm. long, is brownish silvery above lateral line,

¹ Dr. Longley followed Jordan, Evermann, and Clark (Check list, 1930, p. 360) in using *bimaculatus*. Those authors stated (footnote), "Poey seems to have been the first to recognize the identity of *ocellatus* (which has page priority) with *bimaculatus*. He chose to use *bimaculatus*, which should therefore stand." However, *ocellatus* clearly has absolute priority, as is shown above. Accordingly I have taken the liberty of inserting *ocellatus* for *bimaculatus*. —S. F. H.

shading into pale silvery on lower part of side; a black vertical ocular band about three-fourths diameter of eye above and scarcely wider than pupil below eye, with a pale border both anteriorly and posteriorly above eye; a broad dark band across body at and behind end of dorsal and anal bases, broadly expanded on dorsal, but narrow on anal; soft dorsal with a submarginal dark line, and about six or seven lines a little darker than ground color, on upper part of side under spinous dorsal; dorsal and anal brownish at base and paler distally; caudal, ventrals, and pectorals pale straw color.

A note on the color of a fresh specimen by Dr. Longley states that the borders of the ocular band were sulphur yellow, and the dorsal and anal, exclusive of narrow white margins, were yellow distally.

The following enumerations are based on 2 specimens: D. XIII,23, XIII,23; A. III,19, III,19; P. 14, 15; scales along middle of side 40, 40. Depth about 1.6 to 1.9.

Apparently previously reported only from the West Indies.

S. F. H.

Chaetodon aya Jordan

Two records of its capture were found among Dr. Longley's notes, 2 specimens, 90 and 102 mm. long, having been taken in 39 fathoms, and 5 more, 41 to 85 mm. long, in 40 fathoms. There are 8 specimens, however, 27 to 98 mm. long, in the collection, showing that it probably was taken a third time, of which no record seems to have been made in the field notes.

The specimens were compared with one in the U. S. National Museum (no. 37747), supposedly the type, with which they seem to agree perfectly.

General color of preserved specimens slightly brownish above lateral line, this color shading into silvery below lateral line; two conspicuous black bars present, the first extending from origin of dorsal (sometimes encroaching on the anterior spines), through eye, to end of maxillary, being much wider above eye than below it, this band now, as in life, with a pale margin on both sides; second bar running obliquely downward and backward from under middle of spinous dorsal to middle of base of anal, also with pale borders; bases of dorsal and anal brownish, the rest of these fins, as well as the other fins, plain translucent. In the fresh material Dr. Longley described some of the fins as follows: "There is considerable yellow on the outer parts of the spinous dorsal, which becomes a sharp line along the outer margin of the scaly sheath, which extends only halfway up. Remainder transparent. Ventrals are yellow, except spine, which is white. Posterior half of anal yellow. Caudal same, tending toward transparency distally."

This species has a rather produced snout, and a concave anterior dorsal profile, wherein it differs from the other local species of the genus. This species seems rather intermediate of *Chaetodon* and *Prognathodes*, but may remain with *Chaetodon* until further revisional studies are made.

The following enumerations and measurements are based on Tortugas specimens: D. XIII(once XIV in 8 specimens counted),18 to 20; A. III,15 to 17; P. 13 or 14. Head (2 specimens, 32 and 89 mm., measured) 2.7 to 3.0; depth 1.6 to 1.8; longest dorsal spine 2.4 to 2.6. Eye in head 2.9 to 3.0; snout 2.4 to 3.0 (apparently

increasing in length with age); interorbital 3.8 to 4.0; pectoral 1.35 to 1.45; longest anal spine 1.4. Scales difficult to count accurately, about 40 to 44 oblique rows along middle of side. The number given for the type in the original description is 36, but if oblique rows are counted about 40 may be seen. The anal and pectoral rays cannot be counted accurately in the type, but the dorsal definitely has XIII, 18, though the original description gave XII, 18. The anal formula was given as III, 17, which comes within the range of Tortugas specimens.

Gulf of Mexico, apparently not entering shallow shore waters. S. F. H.

Pomacanthus arcuatus (Linnaeus). BLACK ANGELFISH

Chaetodon arcuatus Linnaeus, Syst. nat., 10th ed., 1758, p. 273—"India." Poey, Repertorio, vol. 2, 1868, p. 351.

Chaetodon paru Bloch, Naturgesch. ausland. Fische, vol. 3, 1787, p. 57, pl. 197, fig. 1—Brazil.

Chaetodon lutescens Bonnaterre, Tab. encyc., Ichth., vol. 6, 1788, p. 82—Jamaica.

Pomacanthus cingulatus Cuvier and Valenciennes, Hist. nat. poiss., vol. 7, 1831, p. 209, pl. 185—West Indies.

Pomacanthus quinquecinctus Cuvier and Valenciennes, *ibid.*, p. 210—West Indies.

Chaetodon littoricola Poey, Repertorio, vol. 2, 1868, p. 351—Cuba.

Pomacanthus arcuatus Longley, Carnegie Inst. Wash. Year Book No. 34, 1935, p. 283.

The synonymy given was indicated by Dr. Longley (see last reference above). To this may be added virtually all references to *Pomacanthus paru* in recent books. Dr. Longley's reason for using *arcuatus* instead of *paru*, a name long accepted, is stated in the first paragraphs of his discussion of *P. aureus*.

Nothing on this species was found among Dr. Longley's manuscripts, and I strongly suspect that part of the discussions pertaining to this genus, and perhaps family, has been lost.

If it is correct to assume that Dr. Longley always listed this species in his field notes under *P. paru*, then observations and records of capture are limited to eight instances. It is reported from an old wreck, from off beach rocks, from Bird Key reef, from among coral heads, and from a channel off Bird Key reef. The number of individuals seen evidently was not great, and that it is less common than *P. aureus* is stated in the discussion of that species.

The color pattern is not fully described in Dr. Longley's field notes. It is stated only that the young have dark crossbars separated by "narrow yellow lines." In published accounts the "yellow lines" generally are called bars and the dark between them the ground color. In any event the yellow bars are lost with age, and the fish become almost black, except for yellow margins on some of the scales.

This species, as understood by Longley, is distinguished by the convex caudal fin and its rather rounded lobes, in contrast with a straight or slightly concave margin with angulate lobes in *aureus*. Furthermore, *arcuatus* generally has 10 spines in the dorsal, whereas *aureus* usually has only 9. A rather convenient difference in separating preserved adults is the very narrow white margin of the caudal fin in *arcuatus*, in contrast with the rather broad one in *aureus*. Minor differences in the color of the young are pointed out under *aureus*.

Atlantic coast of tropical America, northward to Florida.

S. F. H.

Pomacanthus aureus (Bloch). BLACK ANGELFISH

(Plate 22, figures 1, 2)

Chaetodon aureus Bloch, Naturgesch. ausland. Fische, vol. 3, 1787, p. 49, pl. 193, fig. 1—Martinique (on a drawing by Plumier).

Chaetodon luteus Bonnaterre, Tab. encyc., Ichth., vol. 6, 1788, p. 88, pl. 92, fig. 381 (after Bloch).

Pomacanthus balteatus Cuvier and Valenciennes, Hist. nat. poiss., vol. 7, 1831, p. 156—Puerto Rico.

Pomacanthus rathbuni Miranda Ribeiro, Arch. Mus. nac. Rio de Janeiro, vol. 17, 1915 (Chaetodontidae, p. 7), with fig.—Bahia, Brazil.

Bloch's figure of *Chaetodon aureus* poorly represents a species of *Pomacanthus*, as is shown by the armature of the preopercle and contours of the posterior borders of dorsal and anal fins. The form of the caudal more closely approaches that of *P. arcuatus* than that of this species, but the dorsal spines are too many for either. From examination of the plate alone, one might hesitate to say which of the two had been drawn. Cuvier and Valenciennes, however, stated that this figure is a poor copy of Plumier's first sketch, of which they had seen a better one by Aubriet representing one of Parra's *Chirivitas* (Desc. dif. Piezas hist. nat., 1787, pl. 6, fig. 2). If they are in error in their identification, *aureus* is a synonym of *arcuatus* and the species here discussed is *P. balteatus*.

This species is much more common than *P. arcuatus*, and possibly most common of Tortugas angelfishes. It may be seen singly or in pairs in shallow water on the open reef throughout the group. The largest individuals that still display the juvenile coloration are the most numerous.

Young to perhaps the length of 175 mm. show a pattern of five or six narrow yellow bars on a dark brown or blackish ground. The first cuts off a rostral dark spot about the mouth; the second meets its fellow on the nape and before the pectorals; the third defines posteriorly a humeral bar and extends on dorsal, and ventrally ends just before anal origin; the fourth bar crosses body between 18th dorsal and 12th anal rays, extending on dorsal and anal; and the fifth bar covers basal third of caudal and its borders above and below. Posterior margin of the caudal, transparent at first, may develop into a sixth bar, enclosing with the fifth one a dark lenticular spot. Posterior face of the pectoral citron yellow; posterior border of dorsal narrowly yellow, anal narrowly blue.

As the fish grow, the yellow bar on the base of the caudal becomes gray and eventually disappears, but the one bordering the truncate caudal remains. The bar behind the pectoral is last to disappear. Transformation is effected at no constant size, for specimens in full adult coloration may be seen with others an inch or two longer, still showing their last gray bar or bars.

The diet includes algae and a great variety of sedentary animals.

Atlantic coast of tropical America to Florida, sometimes straying northward.
W. H. L.

Holacanthus tricolor (Bloch)

Chaetodon tricolor Bloch, Naturgesch. ausland. Fische, vol. 9, 1795, p. 103, pl. 426—Cuba.

Sarothrodus ataeniatus Poey, Repertorio, vol. 2, 1868, p. 353—Cuba.

I have seen a single adult and no young. Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 248) also reported 1 specimen.

Metzelaar's figure (Trop. atl. Vissch., 1919, p. 93, fig. 28) of the young of *Holacanthus tricolor* at 39 mm., and examination of Poey's 22-mm. type of *Sarothrodus ataeniatius* (Mus. Comp. Zool. no. 16251), make it possible to assign Poey's species to the synonymy here, for it is, except for size, the same as Metzelaar's specimen. The spine at its preopercular angle and its ocellus are both very clear.

Atlantic coast of tropical America, northward to Florida and Bermuda.

W. H. L.

Holacanthus ciliaris (Linnaeus). QUEEN ANGELFISH

Chaetodon ciliaris Linnaeus (part), Syst. nat., 10th ed., 1758, p. 276—Indies. Bloch, Naturgesch. ausland. Fische, vol. 3, 1787, pl. 214.

Chaetodon squamulosus Shaw, Naturalist's miscellany, vol. 8, 1796, p. 275 (after Catesby).

Chaetodon parrae Bloch and Schneider, Syst. ichth., 1801, p. 235—Cuba (after Parra).

Holacanthus cornutus Desmarest, Mem. Soc. Linn. Paris., vol. 2, 1823, pl. 3, fig. 3—Cuba.

Holacanthus formosus Castelnau, Anim. Amer. Sud, Poiss., 1855, p. 19, pl. 11, fig. 2—Bahia. Günther, Cat. fish. Brit. Mus., vol. 2, 1860, p. 47.

Pomacanthus ciliaris Jordan and Gilbert, Bull. U. S. Nat. Mus., No. 16, 1883, p. 615.

Only 1 fully grown specimen and 2 young were seen in the course of much work on the reefs.

The ocellus with dark blue center on the nape, the general richness of coloration, to which the submarginal dark blue of the vertical borders of dorsal and anal fins contributes much, and the completely yellow caudal fin are distinguishing marks of the species in the field.

Holacanthus lunatus Blosser (Ann. Carnegie Mus., vol. 6, 1909, p. 299) has been placed by me in the synonymy of *Angelichthys isabelita*, but incorrectly (Carnegie Inst. Wash. Year Book No. 31, 1932, p. 300). Blosser's plate indicates that his 19-mm. fish is the young either of that species or of *H. ciliaris*, and the fin formulas he gave (D. XIV,18; A. III,18) fit the former. His count, however, is inaccurate, as the formulas actually are, D. XIV,21; A. III,21; P. 17 or 18, or the dorsal spines may be 1 less and the soft rays 1 more, as the last spine or first ray is broken. There is then little doubt that *H. lunatus* is a synonym of *H. ciliaris*.

W. H. L.

The following is from Dr. Longley's notes: "The queen angel has a distinct ocellus at nape, entire tail yellow, dark blue on anterior base of pectoral and on inner webs of dorsal and anal fins, same color as in the ocellated spot on nape. Much the yellowest of the local species, and its rich color is heightened by an orange stripe at the base of the dorsal beginning at the nape."

The Tortugas collection contains 3 specimens, respectively 30, 34, and 83 mm. long. The largest one is in the transition stage, with respect to color, from the young to the adult as described by Dr. Longley. The 2 smaller ones retain the dark bars and much of the other color of the juveniles.

West Indies to Florida.

S. F. H.

Holacanthus isabelita (Jordan and Rutter)

No discussion was found among Dr. Longley's manuscripts, and it is very difficult to decide which of his notes apply to this species. For a long time Dr. Longley was unable to determine definitely to which species to assign the fishes observed. He expected four species of *Holacanthus* until 1922, when he seems to have concluded that *Angelichthys townsendi* Nichols and Mowbray (Bull. Amer. Mus. Nat. Hist., vol. 33, 1914, p. 581) probably was a cross between *H. ciliaris* and *H. isabelita*. Furthermore, he seems to have concluded that the fish he had tentatively identified as *townsendi* actually were *ciliaris*, of which he had seen only 3 individuals. All notes, other than the few referring to the 3 fish finally identified as *ciliaris*, and those concerning *tricolor* (a species which never was in doubt), must then apply to *isabelita* or *townsendi* (the latter a hybrid). I find it impossible, however, to untangle the two.

It can only be stated here that this species seems to be fairly common on the reefs at Tortugas.

I find the following significant note among Dr. Longley's papers: "*Angelichthys isabelita* has no ocellus at nape. Border *only* of caudal is yellow. These two characters are enough to identify it."

The young seem to have two or three pale blue vertical bars on the posterior part of the body, in addition to a "vertical dark bar through eye, meeting its fellow on occiput and at throat. Throat and breast to base of pectorals washed with blue. Posterior margins of preopercle and opercle blue, giving two vertical stripes." No notes on the color of the adult were found. The crossbars, however, seem to disappear with age.

Concerning *townsendi*, recognized as a hybrid, I find the following note, apparently based on a verbal statement by Louis L. Mowbray: "The caudal is all yellow. There is a blue blotch on the nape, but not the well defined ocellus of *ciliaris*. The sides and dorsal fin are more bluish than in *isabelita*."

West Indies to Florida.

S. F. H.

Family ACANTHURIDAE. SURGEONFISHES

Acanthurus Forskål, 1775

KEY TO THE SPECIES

- a. Body deep, ovate, depth about 1.5; anterior profile very steep, straight to slightly concave over snout; D. IX,27; A. III,25 or 26; caudal lancelet always pale *caeruleus*
- aa. Body more elongate, depth about 1.75 to 2.0; anterior profile less steep, more or less convex; D. IX,24½ or 25½; A. III,20½ to 24½; caudal lancelet dark
 - b. Caudal fin lunate, upper lobe not much longer than lower one; sides with a series of narrow vertical dark lines (sometimes missing in preserved material); caudal fin without pale margin . . . *hepatus*
 - bb. Caudal fin deeply lunate, upper lobe notably longer than lower one; no vertical bars on sides; caudal fin with a white margin posteriorly *bahianus*

S. F. H.

Acanthurus caeruleus Bloch and Schneider. BLUE TANG

Although Dr. Longley referred to the blue tang many times in his field notes, no discussion of it was found among his manuscripts. To the synonymy in Jordan, Evermann, and Clark's *Check list* (1930, p. 362) should be added *Teuthis helioides* Barbour (Bull. Mus. Comp. Zool., vol. 46, 1905, p. 127, pl. 3) in accordance with Dr. Longley's list in *Carnegie Institution of Washington Year Book* No. 31 (1932, p. 300).

This species evidently is common, as it was often observed. Generally it was seen in company with *hepatus*. Its habits are slightly different, however, as it is less of a bottom fish, and was often seen swimming high. It was commonly observed on alga-covered bottom near shore, as well as some distance offshore among coral heads and gorgonians, in water 10 to 12 feet deep. Once it was listed from white sandy bottom.

Its food, like that of *hepatus* and *bahianus*, consists wholly of vegetable matter, but mixed with less sand and debris. Its digestive organs are typical of a vegetable feeder, its stomach being large and rather thick-walled, and the intestine very long. A specimen 122 mm. long had an intestine 475 mm. long.

In color it is variable. Some large ones seen in about 9 or 10 feet of water, swimming 4 or 5 feet above bottom, were very deep blue. Some individuals over pale sandy bottom were described as "very light." A small individual, about 60 mm. long, was seen in two color phases. In one phase it was "yellow with three narrow dark stripes on the body, angulated with apex forward; these about width of pupil." In the other phase the body was "olivaceous, and apparently what had previously been the dark stripes were now light: essentially a reversal of the former pattern." A large one with white bands also was observed.

The following notes appear in Dr. Longley's field data: "The young are clear yellow, and this may appear as an alternative phase to the typical blue in specimens up to 100 or 125 mm. in length. Have not seen it in larger ones. In the yellow phase the iris and the margin of dorsal are blue, and the caudal yellow with a blue margin. In the full blue phase the margin of the caudal is often more blue than the remainder of the fin. The blue of the adult is sometimes so dark as to be almost black, but the caudal lancelets are white in all phases." Another observation reads: "I noticed the yellow replaced by blue in a specimen 62 mm. long."

The collection contains 7 specimens, 60 to 150 mm. long. They are now uniform light brown to dark brown, with dorsal, caudal, and anal margined with black. One small specimen retains dark stripes on the dorsal and anal fins that run parallel with the contour of the body at the base of these fins.

A short, deep fish, with a steep anterior profile; caudal fin deeply lunate, with acute lobes, the upper one slightly the longer. The following proportions are based on 2 specimens, 86 and 150 mm. long, and the enumerations on 5 specimens: Head 3.1 to 3.25; depth 1.4 to 1.5. Eye in head 2.6 to 3.3; snout 1.3 to 1.4; interorbital 2.9 to 3.1; caudal peduncle 2.8 to 3.0; pectoral 1.0. D. IX, 27; A. III, 25 or 26; P. 16 or 17.

Atlantic coast of tropical America northward to Florida, sometimes straying to Cape Cod.

S. F. H.

***Acanthurus hepatus* (Linnaeus)**

Teuthis hepatus Linnaeus, Syst. nat., 12th ed., 1766, p. 507—Carolina.

Hepatus pawnee Breder, Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 73, fig. 32—Glover Reef, off British Honduras.

Common, very frequently in mixed schools with *Acanthurus bahianus*, from the shore out.

It is almost entirely herbivorous. With its food, however, it swallows much foreign material, only one-quarter to one-third being the algae usually found in its stomach. The stomach is large, rounded, laterally compressed, thick-walled, and muscular.

This species is changeable in coloration; often pale, rather bluish, then showing eight or ten narrow vertical dark bands on the side. Where the bottom is pale but rough, light fish and dark brown ones may be seen together; but on the reef, commonly brown ones only are present. The caudal fin in the brown phase may be bluish, more white toward the lancelet, at the base of which this color ceases abruptly; or it may be brown like the body.

Brassy and blue streaks of equal width slope down from above gill opening to eye, and from eye to nostril; five postocular yellow streaks and three antecular ones present in a specimen before me; often another yellow one below the eye.

The teeth in each jaw are uniserial, flattened, elongate, spatulate, with their distal borders denticulate. They are not rooted in the premaxillaries or dentary, or even ankylosed with them. The tough membrane, however, in which they are set on the dentigerous surfaces allows them relatively little movement.

Dorsal normally with 9 spines; anal with 3. Soft rays in a sample of 30 collected at Tortugas are D. $24\frac{1}{2}$ to $25\frac{1}{2}$; A. $20\frac{1}{2}$ to $24\frac{1}{2}$.

Hepatus pawnee Breder (see reference above) is the young of *A. hepatus*. In 10 cotypes examined, the fin supports were D. IX, $24\frac{1}{2}$ to $25\frac{1}{2}$; A. III, $22\frac{1}{2}$ to $24\frac{1}{2}$. In a sample of 10 from Nassau harbor, in size and appearance quite like Breder's material, the comparable counts were D. IX, $24\frac{1}{2}$ to $25\frac{1}{2}$; A. III, $22\frac{1}{2}$ to $24\frac{1}{2}$. Three specimens from Bermuda, in addition to the normal count for fin spines, have respectively $26\frac{1}{2}$, $25\frac{1}{2}$, and $24\frac{1}{2}$ dorsal rays; and $23\frac{1}{2}$, $22\frac{1}{2}$, and $23\frac{1}{2}$ anal rays. In the specimen last indicated, which is 40 mm. in length, the posterior margin of caudal fin is bordered by white, which with its rounded profile distinguishes it readily from *A. bahianus*. A specimen of the latter, 43 mm. in length, has a relatively straight profile, and a white marginal crescent on caudal fin, which where broadest covers the distal quarter of the central rays and the web between.

Atlantic coast of tropical America northward to Florida and sometimes to Cape Cod.

W. H. L.

***Acanthurus bahianus* Castelnau**

Common everywhere in shallow water, except in the great sand wastes and in *Thalassia*. Found about coral stacks, into and under which it ventures, though it is really a fish of the open. Its distribution is essentially that of the algae which

it may be seen cropping all day long, and which seem to constitute by far the greater part of its food, though it goes readily into traps baited with spiny lobster. This is a bottom fish. It usually slips between gorgonians or other obstructions in going from place to place, whereas *Acanthurus caeruleus* commonly goes over them.

The golden brown, on the open reef, matches very well the dominant color of the algae. It is readily able, too, to display a very pale phase. It is a more gracefully shaped and delicately colored species than *A. hepatus*, and the striping on its dorsal fin is finer by half, but soon disappears after death. The pectoral fins are much more broadly covered by chestnut brown on their posterior faces, and the ventrals are so colored that when they are pressed close to the body the exposed faces match perfectly the pale ventral surface. The pale ring on the caudal is of a yellow cast.

The soft rays in a sample of 10 are: D. $24\frac{1}{2}$ to $26\frac{1}{2}$; A. $22\frac{1}{2}$ to $23\frac{1}{2}$.

W. H. L.

The collection contains 4 adults, 163 to 223 mm. long. The color is uniformly brown. Only 1 specimen retains fine longitudinal dark stripes on the dorsal fin. The caudal is pale-margined, lunate, both lobes acute, the upper the longer. The following proportions and enumerations are based on 2 specimens, 160 and 163 mm. long: Head 3.4 to 3.6; depth 2.0 to 2.1. Eye in head 3.6 to 3.9; snout 1.4; interorbital 3.5 to 3.8; caudal peduncle 2.6 to 2.8; pectoral 1.0. D. IX,24, IX,25; A. III,22, III,22; P. 16, 16.

Atlantic coast of tropical America, northward to Florida.

S. F. H.

Family SCORPAENIDAE. SCORPION FISHES

The following key seems desirable, as some of the species are not well known, and as a few new ones were described recently.

S. F. H.

KEY TO THE GENERA AND SPECIES

- a. Bones of head scarcely cavernous; occiput generally with 2 spines; dorsal fin slightly or at least not very deeply notched, never in two parts, with 12 or 13 spines
 - b. Palatines with bands of villiform teeth; dorsal spines normally 12
 - c. Pectoral with some of the median rays branched
 - d. Scales on top of head cycloid or wanting; cranium with many spines; occiput with a more or less distinct square pit *Scorpaena*
 - e. Occipital pit deep
 - f. A deep pit below and before eye; axil of pectoral with large white spots on a black ground : *plumieri*
 - ff. No suborbital pit; axil of pectoral not with white spots on a black ground
 - g. Eye very large, about 2.5 in head; pectorals long, reaching nearly or quite to end of base of anal *agassizii*

- gg. Eye much smaller, about 3.3 to 4.0 in head; pectorals much shorter
- h. Second anal spine about equal to or shorter than 3d; a single humeral spine
- i. Preorbital with 2 spines; scales in lateral series about 55 to 60; axil of pectoral and lower part of side behind base of pectoral with small brown spots or specks . . . *brasiliensis*
- ii. Preorbital with 3 spines; about 40 scales in lateral series; no dark spots in axil of pectoral or on side . . . *dispar*
- hh. Second anal spine notably longer than 3d
- j. Suborbital keel with 1 spine; coronal spine present; pectoral rays 16 or 17; supraorbital cirrus large or small and occasionally missing; axil of pectoral pale (yellow in life), with small dark spots *bergii*
- jj. Suborbital keel with 2 or 3 spines; coronal spine missing; supraocular cirrus exceedingly long, fringed; pectoral rays 17 or 18; axil of pectoral gray, with very small bluish spots enclosed in black rings . . . *grandicornis*
- ee. Occipital pit very shallow, or almost missing
- k. Second preopercular spine reaching only about halfway to margin of opercle; upper part of eye with peculiar club-shaped dermal appendages, extending down over the cornea, to which they adhere *inermis*
- kk. Second preopercular spine very long, extending nearly or quite to margin of opercle; eye without dermal structures described in k *calcarata*
- dd. Scales on top of head ctenoid; armature of head moderate; no occipital pit
- l. Suborbital keel smooth, or at most with a single small spine anteriorly; gill rakers slender, 16 more or less developed on lower limb of first arch
Helicolenus maderensis
- ll. Suborbital keel with 4 well developed spines; gill rakers very short, spiny, 9 more or less developed on lower limb of first arch *Neomerinthe tortugae*
- cc. Pectoral rays all simple; preorbital margin with 2 strong, divergent spines; suborbital keel with 4 spines; 2d anal spine much larger and stronger than 3d; 3d dorsal spine much produced in large specimens *Pontinus longispinis*

- bb. Palatines without teeth; 13 dorsal spines; suborbital keel with a single spine placed at its terminal end; 17 pectoral rays; dorsal fin rather deeply notched; about 38 scales in lateral series *Scorpaenodes floridae*
- aa. Bones of head cavernous; surface of head with many mucus pores; dorsal fin deeply notched, nearly or quite separate; dorsal with 11 or 12 spines and 10 soft rays *Setarches parmatius*

Scorpaena plumieri Bloch

(Plate 23, figures 1, 2)

Occasional on mud, sand, gravel, or rock bottom, and among coral heads. Very sluggish; often remaining motionless for long periods, except for respiratory movements, which are irregular and sometimes cease for a comparatively long time. Yet once aroused, it is a powerful swimmer. I have seen it dash up from the bottom and, in the twinkling of an eye, swallow a blenny that ventured too near. I have taken 2 such fishes, a portunid crab, and fragments of several other small crustaceans from the stomach of one specimen.

The body is hoary with dermal appendages like rags and tatters of weed. Among algae, combinations of green and yellow occur. I have sometimes found it almost necessary to brush the fish to convince myself that its color and covering were its own. The oblitative effect of its coloration is so pronounced that one may gaze almost directly at it without seeing it. On light sand its dorsal and lateral dark markings are faint, and its shade resembles that of its surroundings. In a slate-bottomed tank the body had four dark bands, the first through eyes, across head; a broad one under first 6 dorsal spines; another very dark one under anterior half of soft dorsal; and still another at base of caudal rays; two very black bars on caudal fin; axil of pectoral conspicuously spotted with white spots on black ground. The general body color extends to the margin of the pupil, itself obscured by flecks of color visible in certain lights. The overlap of conjunctival and iridial patterns is sufficient to reduce to a minimum the conspicuousness of the eye movements.

Atlantic coast of tropical America to Florida, sometimes straying to Cape Cod.
W. H. L.

Scorpaena agassizii Goode and Bean

Rather common at depths of 40 to 60 fathoms. About 40 specimens were secured, measuring 65 to 170 mm. in length. This is one of few species from deep waters that reach the surface alive and live on in the aquarium after the rough treatment in the otter trawl.

Repeated counts show D. XII, 9½; A. III, 5½. The species is distinguishable from others known locally by its strong cephalic spines (3 only on suborbital ridge); an accessory one at base of upper preopercular spine; the large eye, 3.0 in head in a specimen 170 mm. long; and the greatly elongated pectoral fin, reaching very nearly to vertical of end of anal base; pectoral with 19 or 20 rays, the uppermost and lower 12 simple, the remainder divided, the rays increasing so rapidly from below as to make the under border seem almost excavated; dorsal

fin deeply notched, the 5th web being the first to rise as much as halfway to tip of spine behind it.

General color scarlet in life, somewhat speckled with white; two diffuse white bars across caudal; pectorals slightly white-spotted above; ventrals dark in the young, later uniform red, like anal; mouth white within. W. H. L.

The collection contains 9 specimens, 87 to 170 mm. long. This species is well marked by its very large eye and long pectoral fins.

Rather deep water, West Indies to Florida.

S. F. H.

Scorpaena brasiliensis Cuvier and Valenciennes

Common in the deep channels within the atoll, and on similar bottom in slightly deeper water between East Key and Bird Key reef. The maximum size of scores taken is roughly 150 mm.

As it comes up from 10 or 12 fathoms, it is prevalingly red, with the lower part of the side from cheek to caudal showing many spots of brown. In concrete tanks it soon loses its ruddiness and its colors are practically black and gray. The pattern is changeable, but not as notably as the color. Generally a darker bar extends from the cheek through the eye. Four dark bands may appear on the body, the first broadest, and approximately under dorsal origin; center of the second near base of 9th spine; the next beneath middle of soft dorsal; and the last on caudal peduncle. Pectorals crossed by many alternating checkered bars of red and cream, or black and gray; dorsal and anal much mottled; ventrals plain reddish, growing dusky toward tips; caudal with two pale bars, widest dorsally. The body color is carried more or less to the boundary of the pupil, making the eye appear deceptively small, and, thanks to the overlap of the dermal and iridial color, it may roll for some distance without the fact's being betrayed by the out-turning of any unpatterned surface.

D. XII, $9\frac{1}{2}$ or 10; A. III, $5\frac{1}{2}$ or 6, the spines graded from 1st to 3d; pectoral with 18 or 19 rays, extending to vertical of 1st anal ray; a small postorbital spine before and below the tympanic, commonly double; humeral spine single; sub-orbital ridge with a spine below eye and another at its tip; chief preopercular spine with a small supernumerary one at its base; several spines on preopercular border below and sometimes a marginal tooth or teeth above it; ridges in inter-orbital space strong.

W. H. L.

The collection contains 12 specimens, 95 to 150 mm. long. The very deep occipital pit, and the rather sharp brown specks on the lower part of the side, which extend into the axil of the pectoral, seem to be good recognition marks.

Atlantic coast of tropical America, sometimes northward to North Carolina.

S. F. H.

Scorpaena dispar Longley and Hildebrand

Scorpaena dispar Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 246, fig. 12—Tortugas, Florida.

***Scorpaena bergii* Evermann and Marsh**

Many specimens, 50 to 85 mm. long, were seined inside Bird Key reef or taken with the otter trawl in the 10-fathom channels between Loggerhead and Garden keys. Sexual maturity is already attained at the length of 70 mm. Females were spawning in July.

Five specimens examined all had D. XII,10; A. III,6; P. 17, the 4 rays following the uppermost branched,¹ the fin rather small, barely extending past ventrals; 2d anal spine decidedly longer and rather stronger than 3d; dorsal surface of head with nasal, preocular, supraocular, postocular, coronal, parietal, nuchal, and 2 humeral spines; a stout postorbital spine before the occipital one; preorbital with 2 spines at its anterior margin; suborbital keel with a terminal spine only; opercle with 2 flattened spines; preopercle with 4, the uppermost strongest, a supplementary one at its base; the stout, pinnately branched, or flattened leaflike supraorbital cirrus sometimes longer than eye, often missing; other cephalic cirri moderate; some along lateral line larger than others on trunk.

Variation in color is great. Two observed were respectively reddish and greenish and maintained the difference for weeks, though each within limits was capable of change. The living fish often show a dark band crossing interorbital, descending through eye and continuing on cheek; sometimes with a vague dark area above and behind pectoral, varying much in size and sharpness of definition; an irregular bar of ochraceous orange sometimes present beneath middle of soft dorsal; the humeral bar extending on dorsal, the bar between dorsal and anal, and the usually darker pigmented bands on caudal ranging in color between olive and apple green. For identification in life, the pale yellow on the posterior face of the pectoral perhaps provides the best mark, though it does not last. In the yellow of the axil of pectoral are small dark spots; anal irregularly barred; ventrals rosy, with dark spots.

W. H. L.

The collection contains 28 specimens, ranging in length from 47 to 85 mm. These were compared with the type, with which they agree. In 2 specimens (66 and 74 mm. long) and the type (75 mm. long) the scale formulas were 3-37-10, 3-43-11, and 3-39-12 in the type; P. 16, 17, and 17 in the type; gill rakers 8 or 9, including 2 rudiments. The following proportions are based on the same specimens, those for the type being enclosed in parentheses. Head 2.4, 2.5 (2.25); depth 2.65, 2.85 (2.7). Eye in head 3.5, 3.8 (3.25); snout 4.2, 3.8 (3.7); maxillary 1.9, 1.75 (2.0); interorbital 9.5, 7.2 (8.6); caudal peduncle 4.2, 4.0 (4.3); 4th dorsal spine 2.0, 2.2 (2.55); 2d anal spine 1.75, 1.9 (2.1); pectoral 1.3, 1.25 (1.4).

West Indies to Florida.

S. F. H.

***Scorpaena grandicornis* Cuvier and Valenciennes**

This species occasionally was taken on the flats about Long Key and Bird Key reef.

¹ Evermann and Marsh's figure (Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 276, fig. 83) shows no branched rays, an oversight which perhaps explains the transfer of the species to *Pontinus* by Jordan, Evermann, and Clark (Check list, 1930, p. 372).

It sometimes is gray, with clouds of dark color forming irregular bands of clove brown or raw umber, which may include a vertical bar extending through eye and on cheek; another under anterior half of spinous and a third one under soft dorsal; pectorals, anal, and caudal all barred, ventrals largely brown; ventral surface of jaws and throat, and pectoral base anteriorly and in axil with much permanent and characteristic white spotting. It is very variable, however, and in a moment it may change so that brown shades are dominant, and gray secondary. In nature the fish rapidly adjusts itself to its surroundings.

Four dermal cirri at snout, preorbital, and nuchal long and thin; supraorbital cirrus reaching base of 3d dorsal spine, finely fringed on its posterior margin; other cirri of head well developed; about 9 flattened, pinnate cirri, as long as eye's diameter, along lateral-line scales at nearly equal intervals; body with many more.

Coronal spines missing; 2 pairs of humeral spines; each tympanic preceded by a small divided postorbital spine; 2 or 3 spines on suborbital ridge, and an accessory one at base of chief preopercular spine.

Second anal spine about as long as 3d, and much stronger; pectoral rays usually 17 or 18, occasionally 15, the upper one and all but the following 6 usually simple.

Atlantic coast of tropical America to Florida, sometimes straying northward to Cape Cod.

W. H. L.

Scorpaena inermis Cuvier and Valenciennes

Scorpaena inermis Cuvier and Valenciennes, Hist. nat. poiss., vol. 4, 1829, p. 311—Martinique.

Scorpaena occipitalis Poey, Memorias, vol. 2, 1860, p. 171—Havana. Longley, Carnegie Inst. Wash. Year Book No. 34, 1935, p. 284.

Scorpaena albifimbria Metzelaar (not of Evermann and Marsh), Trop. atl. Vissch., 1919, p. 144—Curaçao; Aruba.

Scorpaena grandicornis Breder (not of Cuvier and Valenciennes), Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 82—Royal Island, Bahamas, in 18 fathoms.

The type¹ is 67 mm. in length (standard length 55 mm.); depth at dorsal origin 18 mm. (3.1), thickness above pectorals 12 mm., head 28 mm. (2.0); eye 8.0 mm. (3.25 in head), interorbital width 2.0 mm.; the uppermost and lower 14 pectoral rays simple, the remaining 5 branched.

Three spines on suborbital keel, including spine at preopercular angle with no supplementary one at its base, extending halfway to opercular margin; 2 spines at lower margin of preorbital; 4 on margin of preopercle, below the strong spine at its angle; preocular, supraocular, postocular, and a pair of coronal spines at anterior border of the shallow occipital pit; another pair at posterior part of the pit laterally, followed almost immediately by a 3d, and then by a 4th slightly farther from mid-line; another spine lateral to the 4th; a pair of minute spines behind eye, close together and before the fairly strong temporal spine; interorbital groove deep, with an almost imperceptible pair of submedian ridges.

A pair of cirri at anterior nostrils; another cirrus on posterior spine of pre-

¹ The type was examined by Dr. Longley in the Musée d'Histoire Naturelle, Paris.—S. F. H.

orbital; one or more on lower preopercular spines; several moderate ones along lateral line; and a few inconspicuous ones along side below lateral line. Very characteristic of the species are the leaflike cirri along the upper border of the opaque skin enclosing the eye. From the bases of several, dermal structures extend on the surface of the cornea, resembling a series of flat cirri with narrow stalks and rounded, expanded tips closely adherent to the eye's face. These dermal structures on the eye are diagnostic. The short, flat, and simple cirri of the sides, and the disproportion between these and the larger, crenulate or toothed units of the lateral-line series, also are characteristic.

From lack of material authoritatively named, *Scorpaena occipitalis* has been known only through Poey's record. *Scorpaena occipitalis*, however, is a synonym of *inermis*, or is the same as *calcarata*, or is a species still known only from Poey's description. The shallowness of the pit excludes other possibilities. However, the 2 parallel suprascapular spines, the elevation of the orbital margins to form a deep interorbital groove, and the 2d anal spine approximately equal to the diameter of the eye, which is contained 3.5 times in the head, appear to remove *calcarata* from need of further consideration. Its color would seem to do so too, for from Tortugas specimens of *calcarata* one might infer almost certainly that that species never shows a phase marbled with yellowish. One may note also that *calcarata* appears so far to have been collected nowhere south of the Florida Strait. In the respects mentioned, and in others, *inermis* corresponds very closely to Poey's description of *occipitalis*. From the known occurrence of *inermis* at Havana, from the agreement of *occipitalis* with *inermis* in rarity, size, and general type of coloration, from the possession by both of a narrow, deep interorbital groove, 2 parallel suprascapular spines, a 2d anal spine equal in length to the diameter of the eye, and an eye of equal size, it seems right to refer Poey's species at least tentatively to the synonymy of *inermis*.

Scorpaena inermis is rather rare, appearing occasionally among fishes seined on grass flats about Long Key and inside Bird Key reef. It is a small species, sexually mature at a length of 80 mm. or less.

In coloration this is perhaps the most readily changeable of local species of *Scorpaena*. In some phases its color is rich and variegated. In others it is almost white, or pale over the head only, with diffuse duskiess on the body and more evident pattern on the fins. It has power to show in an instant blotched browns and olive, with red or maroon on the fins, but in all phases its breast, axilla, and belly remain plain white.

W. H. L.

The collection contains 9 specimens, 55 to 95 mm. long. This species is rather close to *S. calcarata*. The chief preopercular spine, however, is much shorter in *inermis*, wherein it does not reach more than halfway to opercular margin; the peculiar dermal structures on the opaque skin on upper part of eye, extending down over the cornea, to which they adhere, as already stated, are diagnostic. In color, the preserved specimens of this species are darker, having more brown, which is in blotches and often in crossbars.

West Indies to southern Florida.

S. F. H.

Scorpaena calcarata Goode and Bean

Scorpaena calcarata Goode and Bean, Proc. U. S. Nat. Mus., vol. 5, 1882 (1883), p. 422—Clearwater Harbor, Florida. Longley, Carnegie Inst. Wash. Year Book No. 34, 1935, p. 284.

Scorpaena russula atlantica Nichols and Breder, Proc. Biol. Soc. Washington, vol. 37, 1924, p. 21, pl. 7—off Galveston, Texas.

The type of *calcarata*, 55 mm. in length, is no longer perfectly preserved, but deterioration has not masked its identity, as is evident from the shallow occipital pit, 2 distinct longitudinal ridges in interorbital space, a short spine on ascending border of preopercle above long spine at angle, which extends nearly to opercular border, and the eye lacking opaque extensions on the cornea above as in *inermis*.

It is clear that the original description is incorrect in stating that the pectoral rays are simple in the type, as 1 or 2 simple rays above are followed by 4 or 5 branched ones. From comparison with better-preserved specimens there is little doubt that originally the type had 6 branched rays following a single simple ray above, and followed by 14 unbranched ones below.

Neither this species nor *inermis*, with which it has generally been united, is in the structure of its pectoral fin transitional between normal *Scorpaena* and *Pontinus*, as is suggested by Jordan and Evermann (Bull. U. S. Nat. Mus., No. 47, pt. 2, 1898, p. 1854).

Taken rather commonly at Tortugas in 10-fathom channels within the lagoon, and at depths of 12 to 15 fathoms east of Bush Key and Bird Key reefs. Specimens 45 to 135 mm. long have been included in the catch; none were in breeding condition.

The proportional measurements of a specimen from Tortugas, 67 mm. long, are as follows: Depth 3.1; head 2.1. Eye in head 3.0; interorbital width 2.66.

In 1 of 6 specimens examined, the dorsal spines are 11, in the others 12; the soft rays are once 11, otherwise 10. The anal formula is III,5 in 5 specimens, and III,6 in the other one; pectoral rays 19 in 1 fish, and 20 in the others. Five times the upper ray is simple, once branched, the next 5 to 7 branched, the lower 12 to 14 simple, fin reaching anal origin; 2d anal spine twice in depth, slightly shorter and stouter than 3d, which is only a little longer than diameter of orbit; occipital pit shallow, becoming almost obliterated with age; maxillary reaching vertical of posterior border of pupil; teeth villiform in jaws, and in a narrow band on vomer and palatines; spines on head weak; nasal, preocular, supraocular, postocular, coronal, parietal, nuchal, tympanic, and a single humeral spine present; also 2 small postorbital spines; 2 on lower border of preorbital; 2 on suborbital keel; a long spine at angle of the preopercle without a supplementary one at its base, extending nearly to subopercular border; below this 4 spines; several teeth on preopercular border above angle, inclined upward and appearing first at the length of about 65 mm.; scales cycloid; none on snout, jaws, or top of head; about 48 rows between upper margin of opercular cleft and base of caudal; 25 with pores.

The fish are largely red when taken. They are changeable in color, however,

and in aquariums replace much of their red with brown. In all color phases the breast, pectoral axil, and belly are plain white; ventrals rosy, unspotted, dusky distally; preserved specimens with vaguely defined dusky blotch below lateral line under spinous dorsal; mouth white within.

W. H. L.

The collection contains 20 specimens, 63 to 145 mm. long. The very shallow occipital pit and the long preopercular spine seem to characterize the species. The high number of pectoral rays (19 or 20) also separates this species from many others of the genus.

Florida to Texas.

S. F. H.

***Helicolenus maderensis* Goode and Bean**

Taken at Tortugas in 100 to nearly 300 fathoms.

D. XII, $11\frac{1}{2}$ or $12\frac{1}{2}$; A. III, $5\frac{1}{2}$; P. 19. Web of soft dorsal and anal fins very delicate, often destroyed in the trawl; scales ctenoid, extending on cheeks and maxillaries, and somewhat in interorbital space; pores in the lateral line about 30; scales along middle of side about 60. Head 3.0 to 3.25; depth 3.0 to 4.0. Eye very large, longer than snout, 2.8 to 3.0 in head; interorbital width 2.75 to 3.0, in 2 specimens 180 and 210 mm. in length; gill rakers slender, 16 more or less developed on lower limb of first arch.

Ground flesh color, at 100 mm. still fairly irregularly banded with five bands; base of dorsal between spines 8 and 10 with a dark spot half as large as eye. At a length of 220 mm. the body is still flesh-colored, but the bands have nearly disappeared; head reddish above, inclining to orange about jaws; soft dorsal and caudal of about same color; outer border of spinous dorsal maroon; pectoral orange above, rosy below; ventrals and anal rosy; mouth posteriorly, pharynx, and operculum slaty within.

This species has been synonymized with *Helicolenus dactylopterus* by Jordan, Evermann, and Clark (Check list, 1930, p. 370), but seems distinct. West Atlantic specimens have a slightly smaller eye than 2 from the Azores (U. S. Nat. Mus. nos 23302, 94491), and have almost uniformly a well developed spine on the suborbital ridge, whereas the others have none.

W. H. L.

The collection contains 11 specimens, 62 to 235 mm. long. As the character of pectoral rays, whether simple or branched, often is given as of generic importance, it is interesting that specimens under about 110 mm. long have the rays all simple, somewhat larger ones have a few divided ones, and adults have several. One specimen 200 mm. long, for example, has the upper 2 rays simple, the next 9 branched, and the lower 8 simple. Norman in his revision of the genera of Scorpaenidae (Discovery rept., vol. 12, 1935, p. 21) pointed out the absence of divided rays in the young.

This species is listed from several hauls in Dr. Longley's notes, as many as 41 specimens having been taken in one haul, and 22 in another.

Deep water off the Atlantic coast of the United States from southern New England southward.

S. F. H.

Neomerinthe tortugae Hildebrand

Neomerinthe tortugae Hildebrand, in Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 247, fig. 13—Tortugas, Florida.

Pontinus longispinis Goode and Bean

Dr. Longley listed it in his field data from 10 hauls at depths of 60 to 140 fathoms. As many as 21 specimens were taken in a single haul, indicating that the species is common in moderately deep water. Fish up to 220 mm. in length were caught.

The color of fresh specimens is described as faintly rosy above, deeper red on head, and white below; ten small brassy spots along lateral line; pectoral faintly barred with half a dozen rows of small orange points on the rays; soft dorsal similarly marked; caudal very distinctly brown, spotted with white vertical streaks on a transparent ground; posterior part of roof of mouth yellow.

Preserved specimens are pale, with a more or less quadrate dusky blotch on occipital. Large specimens have small scattered dark spots on the upper part of the body, and on the soft dorsal and caudal; these are missing in specimens under about 120 mm. in length.

In large individuals the 3d dorsal spine is much longer than the others, but this difference is not very evident in specimens under about 120 mm. The 2d anal spine is greatly enlarged at all sizes, being much longer and stronger than the 3d; suborbital keel with 4 spines; preorbital margin with 2 strong divergent spines; subopercle with 2 retrorse spines; pectoral rays all simple; scales extending forward on interorbital and snout, where they become very small.

The specimens were compared with the type, with which they agree.

The following proportions and counts are based on 4 specimens from Tortugas, 93 to 220 mm. long, and the type (U. S. Nat. Mus. no. 39323), which is 153 mm. long. The proportions and enumerations for the type are enclosed in parentheses. Head 2.4 to 2.6 (2.5); depth 3.0 to 3.33 (3.2). Eye in head 3.75 to 4.2 (3.5); snout 2.9 to 3.2 (2.75); maxillary 2.0 to 2.2 (2.05); interorbital 8 to 10 (9.3); caudal peduncle 3.9 to 4.3 (4.4); 3d dorsal spine 1.7 to 2.2 (2.0); 2d anal spine 1.8 to 2.1 (2.0); pectoral 1.3 to 1.4 (1.5); ventral 1.5 to 1.7 (1.75). D. XII,10 (XII,10); A. III,5 (III,5); P. 17 (16); scales 6-52 or 53-8 to 10 (7-47-10); gill rakers 9 or 10 and about 4 rudiments (9 + 4).

Gulf of Mexico to the Florida Keys.

S. F. H.

Scorpaenodes floridae Hildebrand

Scorpaenodes floridae Hildebrand, in Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 251, fig. 14—Tortugas, Florida.

Setarches parmatus Goode

Setarches parmatus Goode, Proc. U. S. Nat. Mus., vol. 3, 1880, p. 480—off coast of Rhode Island.

Scorpaena colesi Breder (not of Nichols), Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 83—off coast of British Honduras, 366 fathoms.

Nineteen specimens, the largest 120 mm. long, taken at depths of 150 to 250 fathoms, are listed in Dr. Longley's notes.

This species is readily recognized by the deeply notched dorsal fin, the spinous and soft parts being nearly or quite separate, and by the reduced number of dorsal spines, the formula being X-I,₁₀ and XI-I,₁₀ in 2 Tortugas specimens. The head is cavernous, with large pores, and the preopercle has 5 prominent spines.

In deep water from southern New England to Florida.

S. F. H.

Family PERISTEDIIDAE

Peristedion Lacépède

Peristedion Lacépède, Hist. nat. poiss., vol. 3, 1802, p. 368 (*P. malarum* Lacépède = *Trigla cataphracta* Linnaeus).

Vulsiculus Jordan and Evermann, Check list, 1896, p. 489 (*Peristedion imberbe* Poey).

Members of this genus are notably specialized. They are also so true to their several types that multiple differences in proportions, in length, shape, and degree of divergence of their rostral processes, in the arrangement of their barbels, the number and form of their cephalic keels and spines, sculpturing of their scutes, and form and proportions of the terminal spines of the three series ending on either side of the caudal fin readily distinguish them.

W. H. L.

The following key will aid in showing the relations of the local species.

S. F. H.

KEY TO THE SPECIES

- a. Rostral processes very long and thin, much longer than eye, about 2.6 to 3.0 in head (head measured from base of rostral processes to tip of opercular spine); head quite to moderately narrow, its width about 1.7 to 2.7 in its length
 - b. Head very narrow, preopercular ridge scarcely expanded, its width about 2.5 to 2.8 in its length; last scute (on base of caudal) in lateral-line series very small, much smaller than those in dorsal and ventral series; principal mandibular barbel short, about reaching angle of mouth; lower part of side with a silvery band *imberbe*
 - bb. Head broader, the preopercular ridge much more prominently expanded; last scute in lateral line not much if any smaller than those in dorsal and ventral series; mandibular barbel longer, reaching nearly to base of ventral; no silvery band on side . . . *longispathum*
- aa. Rostral processes notably shorter and thicker, equal to or shorter than eye, about 4.4 to 8.0 in head; head very broad, expanded posteriorly, its width about 1.4 to 1.5 in its length
 - c. Spines on head very strong; supraorbital ridge with 3 principal spines and some smaller ones; rostral processes very short, about 8.5 to 9.5 in head; principal mandibular barbel very long and thick, reaching base of pectoral *miniatum*
 - cc. Spines on head notably smaller; supraorbital ridge with only 1 small spine, placed over posterior part of eye; rostral processes somewhat longer, about 4.2 to 5.5 in head; principal mandibular barbel shorter and much more slender
 - d. Spines on scutes in arch of lateral line obsolete; eye large,

- its diameter greater than interorbital space, about 3.5 to 3.8 in head; principal mandibular barbel scarcely reaching angle of mouth; lower part of side with a silvery band . . . *platycephalum*
- dd. Scutes in arch of lateral line with definite spines; eye notably smaller, its diameter about equal to interorbital, 4.1 to 4.6 in head; principal mandibular barbel longer, reaching nearly to opercular border if laid straight back; no silvery band on side *spiniger*

Peristedion imberbe Poey

Pterystedion imberbe Poey, Memorias, vol. 2, 1861, p. 367—Cuba.

Peristedion micronemus Poey, Ann. Lyc. Nat. Hist. New York, vol. 9, 1870, p. 321—Cuba.

Peristedion gracile Goode and Bean, Ocean. Ichthyol., 1895, p. 473, fig. 387—Gulf of Mexico.

A rather common fish, taken between 40 and 94 fathoms; reaching at least 175 mm. in length.

Head little depressed, very slightly expanded posteriorly; rostral processes thin, nearly parallel, almost half as long as distance from their base to preopercular margin; spines of head in adult very weak or wholly absent; preorbital, nuchal, and preopercular spines relatively stronger in young; spines on scutes in arch of lateral line weak or wanting; median lateral scute at base of caudal with a weak nonserrate spine or none; other 2 scutes each with a strong spine, strongly serrate on its outer margin; 2 anterolateral fringed barbels beneath lower jaw, reaching slightly beyond angle of mouth; a pair of short barbels, and a group of 3 before these on anterior margin of jaw; other barbels half their length behind them and beneath the jaw.

That the type of *Peristedion imberbe*, which I examined in the Museum of Comparative Zoölogy, is the young of *P. gracile* is indicated clearly, despite its small size (total length 55 mm.) and mutilation, by its compressed head, reticulate pattern of dark lines on pectoral fins, and the weak, unserrated spine of last scute of lateral series ending at base of caudal.

W. H. L.

The collection contains a fine series of specimens. The following proportions and enumerations are based on 3 individuals, respectively 100, 145, and 148 mm. long: Head in standard length (both measured without rostral processes) 2.5 to 2.6; depth 5.9 to 6.1; anal base 2.3 to 2.4. Eye in head (measured between bases of rostral processes and tip of opercular spine) 2.0 to 2.1; eye 5.5 to 5.8; interorbital 4.8 to 5.1; width of head 2.5 to 2.8; rostral process 2.6 to 2.8; ventral 2.0 to 2.1; pectoral 2.0 to 2.3. D. VIII, 20; A. 18 or 19; P. 12 + 2; scutes in lateral line 4 + 29 or 30 + 0; gill rakers 18 or 19.

Preserved specimens are plain, with a bright silvery band between median lateral (lateral-line) row of scutes and ventral ones, which among local species is present only in this species and *P. platycephalum*. The pectoral is largely white with dusky areas. The first dorsal, too, is largely white, with a dusky band on mid-length of rays; second dorsal with pale spots and a dusky band.

Gulf of Mexico to West Indies.

S. F. H.

***Peristedion longispathum* Goode and Bean**

Apparently common at depths of 110 to 283 fathoms. Records of its capture in 14 different hauls with the otter trawl were found, and as many as 20 to 40 specimens were taken in single hauls. The largest one was 205 mm. long.

Concerning color I found the following: "Good deal of yellow with the red on back. Both dorsals dark-margined. Pectorals with a subterminal dark line on a red ground."

The following proportions and enumerations are based on 3 specimens, respectively 146, 170, and 175 mm. long: Head in standard length (both measured without rostral processes) 2.4 to 2.6; depth 5.3 to 6.3; anal base 2.4 to 2.5. Eye in head (measured between bases of rostral processes and tip of opercular spine) 4.8 to 5.1; snout (without processes) 2.2 to 2.4; interorbital 6.0 to 6.2; width of head 1.6 to 1.7; rostral process 2.7 to 3.1; ventral 2.0 to 2.25; pectoral 2.1 to 2.3. D. VIII-18 to 20; A. 20 to 22; P. 11 + 2; scutes in lateral line 4 + 28 or 29 + 1; gill rakers 20 to 22.

Rostral processes long and thin; longest barbel if laid straight back generally reaching opercular margin, and about twice diameter of eye; ventral reaching origin of anal, adherent to abdomen by membrane for half its length; pectoral reaching a little beyond origin of anal.

West Indies to Florida, in rather deep water.

S. F. H.

***Peristedion miniatum* Goode**

Not rare south of Tortugas, where it occurs in about 150 to 300 fathoms.

In several specimens examined, the fin formulas are D. VIII, 18½ or 19½; A. 19 to 20½. In a specimen 200 mm. long, the head is depressed and expanded posteriorly; rostral processes parallel, slight, gently recurved dorsally, not longer than vertical diameter of orbit; a pair of small spines at base of rostral processes; a pair between anterior nasal apertures, and 2 on preorbital margin before angle of mouth; spines on orbital margin stronger than in other species here discussed; the 3 pairs at vertex very sharp and strong; suborbital ridge distinct; ridge before preopercular spine armed with 2 strong, bladelike teeth; another strongly developed tooth in line with preorbital margin; ventral to this one, still 2 others; all scutes in lateral line armed with strong spines; 32 scutes to base of caudal, including 4 in the arch; long barbels at angles of mouth reaching pectoral base; mandible with several smaller barbels.

W. H. L.

Concerning the color Dr. Longley has the following: "Ventral fins and branchiostegal membranes red. Outer half of pectoral dusky, with an irregular dusky bar. Webs of first dorsal near outer margin with a series of spots; second dorsal narrowly red-margined."

Head in standard length (both measured without rostral process) 2.7 and 2.75 in 2 specimens 220 and 230 mm. long; depth 5.2, 6.0; anal base 2.3, 3.4. Eye in head (measured from bases of rostral processes to tip of opercular spine) 5.2, 5.3; snout (without process) 2.1, 2.1; interorbital 5.4, 6.1; width of head 1.4, 1.6;

rostral process 7.7, 8.2; ventral 1.6, 1.8; pectoral 2.1, 2.25. Gill rakers on lower limb of first arch 20, 20; pectoral rays 11, 11.

Rather deep water in Gulf Stream.

S. F. H.

Peristedion platycephalum Goode and Bean

This species seems to have been taken less frequently than some of the others. I have found the record of only two captures in Dr. Longley's notes. Four specimens are listed from a haul made in 60 fathoms, and 2 others from 135 fathoms. The collection, however, contains 9 specimens 133 to 228 mm. long, besides a few juveniles that probably belong to this species. The largest individual listed in Dr. Longley's notes was 287 mm. long.

The following proportions and enumerations are based on 3 specimens, respectively 174, 206, and 228 mm. long. Head in standard length (both measured without rostral processes) 2.6 to 2.9; depth 5.1 to 6.0; anal base 2.8 to 3.1. Eye in head (measured from bases of rostral processes to tip of opercular spine) 3.5 to 3.8; snout (without processes) 2.3 to 2.5; interorbital 3.9 to 4.3; width of head 1.3 to 1.45; rostral process 4.2 to 4.7; ventral 1.6 to 1.8; pectoral 1.7 to 1.75. D. VIII-17 to 20; A. 17 or 18; P. 12 + 2; scutes in lateral line 4 + 27 or 28 + 1; gill rakers 16.

Concerning the color of fresh specimens Dr. Longley has, "This fish is brilliantly red under throat and entire pectorals; both dorsals narrowly red-margined." Preserved specimens are plain, the fins colorless except for obscure dark spots on pectoral. Lower part of side between median lateral (lateral-line) series of scutes and the ventral one with silvery band, almost as prominent as in *imberbe*.

Rather deep water from West Indies to Florida.

S. F. H.

Peristedion spiniger Longley and Hildebrand

Peristedion spiniger Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 253, fig. 15—Tortugas, Florida.

Family TRIGLIDAE. SEA ROBINS

Some of the species of sea robin are closely related and not well understood. The local species are well differentiated, however, and may be recognized by the characters mentioned in the following key.

S. F. H.

KEY TO THE GENERA AND SPECIES

- a. Dorsal spines all comparatively short, pungent, none filamentous; body comparatively long and slender; scales not especially rough, finely serrate *Prionotus*
- b. Pectoral short, scarcely reaching origin of second dorsal; color plain; sides silvery; pectoral mottled with light spots *stearnsi*
- bb. Pectoral longer, reaching to or beyond middle of base of second dorsal; color less plain, and less silvery, generally more or less blotched; pectoral with dark spots or with more or less evident dark bars

- c. Pectoral long, at least 1 ray much produced, filamentous, extending nearly or quite to base of caudal; serrations at angle of snout with an enlarged recurved spine; spinous dorsal with a large ocellated spot on margin of membrane between 4th and 5th spines *alatus*
- cc. Pectoral without produced rays, its posterior margin convex, sometimes failing to reach end of base of second dorsal and sometimes reaching to or a little beyond it; serrations at angle of snout without a definitely enlarged spine; spinous dorsal without a definite ocellus
- d. Occipital groove wanting; well developed nasal and ocular barbels present; opercular and preopercular spines short, not reaching beyond membranous border of opercle *ophryas*
- dd. Occipital groove well developed; nasal and ocular barbels wanting; opercular and preopercular spines long, reaching well beyond membranous margin of opercle *microlepis*
- aa. One or two dorsal spines greatly produced, filamentous (in adults); body more robust, deeper; spines on head large, flaring at base; scales very rough, pectinate *Bellator*
- e. First dorsal spine, only, produced; body moderately slender, depth 3.8 to 4.0; angles of snout merely serrate, without projections; scales only moderately pectinate, the margins not definitely curved outward; pectoral rather short, scarcely reaching opposite middle of base of second dorsal, 2.5 to 2.8 in length . . . *egretta*
- ee. First 2 dorsal spines produced; body deeper, depth 2.9 to 3.2; angles of snout produced; scales strongly pectinate, the margins curved outward; pectoral longer, 1.85 to 2.1 *militaris*

Prionotus stearnsi Jordan and Swain

Several specimens, 100 to 130 mm. long, were taken in 40 to 50 fathoms. As many as 13 fish were captured in a single haul.

A female 130 mm. long, taken on August 7, 1932, had large ovaries with apparently nearly mature eggs. Another, 125 mm. long, taken August 14, 1934, was so ripe that the eggs came gushing when it was removed from the water.

D. IX or X-12½; A. 11½; scales with pores 54, about 80 vertical series above lateral line. Head large, scarcely 3 in standard length; snout long, 2.0 in head. Contour from snout to nape nearly straight; interorbital space slightly concave; mouth large; mandible extending to anterior margin of pupil; premaxillary almost half head; no groove on head behind eye; no small spine at base of preopercular spine; pectoral short, scarcely reaching origin of second dorsal, not extending beyond tips of ventrals; gill rakers 10.

Dusky olive above; sides silvery. The dead fish with very little color; first dorsal dusky; second dorsal streaked; caudal faintly barred; ventral and anal plain; pectoral dark yellow above, mottled with light spots.

The foregoing was compiled from Dr. Longley's field notes. The collection contains 4 specimens, 107 to 130 mm. long.

Gulf of Mexico.

S. F. H.

Prionotus alatus Goode and Bean

Taken in 40 to 67 fathoms.

D. $X-12\frac{1}{2}$; A. $11\frac{1}{2}$. Pectoral $13 + 3$ in several specimens, form of this fin distinctive, only the 9th and 10th rays extending beyond dorsal base, 10th little beyond dorsal, and 9th almost to base of caudal; gill rakers $1 + 2$ rudiments on upper and $8 + 8$ rudiments on lower limb of first arch; scales with pores in lateral line about 53.

In a specimen 105 mm. long (standard length 85 mm.), the proportions are: Depth 4.5; head to tip of opercular flap 2.65. Eye in head 4.6; 2d dorsal spine 1.8, a little longer than 1st and 3d. Snout emarginate and denticulate anterolaterally, the last spine enlarged and recurved; a spine on preorbital margin above rictus; one median to anterior nostril; another at center of ossification on cheek (sometimes obsolete); humeral and lower opercular spines strong; preopercular spine unusually long and strong, with a rather strong accessory spine at base; 1st dorsal spine strongly serrate for half to nearly its entire length. W. H. L.

Dr. Longley intended to add notes on color, as indicated on the margin of his manuscript, but failed to do so. Body of preserved specimens plain brownish; dorsal fins pale, except for a very definite black spot at margin between 4th and 5th spines, and indefinite dusky spots or dusky areas on last few rays of soft dorsal; caudal pale, with black margin; anal and ventrals pale; pectoral largely black, exclusive of filaments, in some specimens; sometimes with bluish spots in the black, barred in other specimens.

The collection contains 8 specimens, 95 to 140 mm. long.

From rather deep water off the south Atlantic and Gulf states. S. F. H.

Prionotus ophryas Jordan and Swain

Taken only in the 10-fathom channels within the lagoon. The largest specimen obtained was 135 mm. long.

D. $X-12\frac{1}{2}$ or $13\frac{1}{2}$; A. 12; P. $14 + 3$ (in 3 specimens examined); pectoral fin reaching almost to tip of lobe of second dorsal; caudal obliquely truncate, lower angle projecting; pores in lateral line 50.

No spinules on sides of snout, on cheek, or on base of preopercular spine; striae of head ciliate rather than serrate; only a median row of teeth on 1st dorsal spine; other dorsal spines and 1st soft ray smooth; posterior border of anterior nostril with a long and simple cirrus, reaching beyond tip of snout if extended forward; a stout compound supraocular cirrus, equal to half diameter of eye, inserted a little before vertical of supraorbital spines.

Much clouded and freckled with brown on a light ground; two brown lines extending from snout across mouth and on mandible; first 3 webs of dorsal very dark distally, the rest of fin brown, its outer margin finely netted with white as the second dorsal is throughout; caudal with basal, median, and terminal brown bars, separated by broader paler bands, the margin netted with white; ventrals and anal irregularly brown-banded; free rays of pectoral very distinctly brown-spotted, remainder of fin, on its outer surface, with a fine tracery of white on brown crossed by several dusky and two chestnut bars, some of its bars becoming

resolved into spots if expanded, and a great central greenish-gray area with large dark spots becoming exposed, the undersurface of fin pale along its upper margin, otherwise slate-colored.

W. H. L.

The collection contains 12 specimens, 60 to 175 mm. long. These were compared with the type (U. S. Nat. Mus. no. 36944), with which they agree, except that the type has no nasal barbels, which may have been lost. All the Tortugas specimens, except the 60-mm. one, have them.

The following proportions and enumerations are based on 3 specimens, 110, 160, and 175 mm. long: Head 2.7 to 3.1; depth 4.2 to 4.3; ventral 2.8 to 3.3; pectoral 1.6 to 1.8. Eye in head 4.3 to 4.6; snout 1.9 to 2.0; mandible 2.1 to 2.25; interorbital 7.4 to 9.7; caudal peduncle 4.2 to 5.0. D. IX or X-12 or 13; A. 11; P. 13 or 14 + 3; scales 90 to 98; gill rakers 9 or 10.

Gulf of Mexico.

S. F. H.

***Prionotus microlepis* Longley and Hildebrand**

Prionotus microlepis Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 254, fig. 16—Tortugas, Florida.

***Bellator egretta* (Goode and Bean)**

Apparently far less numerous than *Bellator militaris*, as only 14 specimens, 55 to 150 mm. long, were secured. These were taken in about 50 to 60 fathoms.

The color of the larger specimens was reddish, with about six parallel yellow lines running up and back on soft dorsal; lower part of side and upper half of caudal sparsely spotted with yellow; belly white; first dorsal irregularly marked with dusky yellow; anal and lower half of caudal red. Smaller individuals, between 50 and 60 mm. long, were flesh-colored and mottled with red; belly white; an ocellus on outer part of membrane of spinous dorsal between the 4th and 5th spine, apparently disappearing with age; anal and lower third of caudal rosy; pectoral barred.

The information concerning the local distribution and color was compiled from Dr. Longley's field notes.

The collection contains 10 specimens, 55 to 150 mm. long. In this species the 1st dorsal spine only, instead of the first 2 as in *B. militaris*, bears a long filament. This is a good diagnostic character when present. It is lost (or undeveloped) in all except 2 specimens in the collection.

The following proportions and enumerations are based on 3 specimens, 96, 120, and 150 mm. long: Head 2.1 to 2.25; depth 3.8 to 4.0; ventral 3.0 to 3.4; pectoral 2.5 to 2.8. Eye in head 4.3 to 4.75; snout 2.3 to 2.5; interorbital 10.5 to 11.6; mandible 2.8 to 2.9; caudal peduncle 6.2 to 7.0. D. XI-11; A. 11; P. 9 to 11 + 3; scales about 92; pores about 58; gill rakers 9.

West Indies to Florida, in moderately deep water.

S. F. H.

***Bellator militaris* (Goode and Bean)**

Fairly common at depths of 40 to 95 fathoms, as many as 26 specimens having been taken in a single haul. The largest one secured was 120 mm. long.

The first 2 spines of the first dorsal are greatly produced, often longer than body, but the filaments sometimes are wanting.

Body dorsally spotted with brown; sides with yellow and white stripes, the yellow ones continuing on upper lobe of caudal; belly rosy, this color extending on lower lobe of caudal; first dorsal with yellow spots, the 2 produced spines (filaments) orange; second dorsal with three yellow lines; anal rosy; pectoral yellow on outer surface, with dark spots, six or more regularly spaced along upper margin; inner surface of fin white above, largely dark below.

The information contained in the foregoing paragraphs was extracted from Dr. Longley's notes.

The collection contains 12 specimens, ranging in length from 46 to 100 mm.

The filaments of the spinous dorsal apparently develop with age. At least, the smallest specimen has none, and there is no indication that it was lost. The next larger one, which is 70 mm. long, has 1 filament attached to the 1st spine, reaching end of base of second dorsal. Only the 2 largest specimens, 90 and 100 mm. long, each have 2 filaments, attached to the first 2 spines, the longest one of which reaches beyond tip of caudal.

Scales very spiny, the margin with the spines on it being curved outward; those in anterior part of lateral line modified into small scutes; some of the other scales in lateral line enlarged; processes on snout rather variable, some specimens with a distinctly enlarged spine in each process, others with several spines of more nearly equal size; supplementary spine at base of preopercular spine always present, but very variable in size.

The following enumerations and proportions are based on 3 specimens, 78 to 100 mm. long: Head in standard length (both measured without rostral processes) 2.0 to 2.2; depth 2.9 to 3.2; ventral 2.5 to 3.1; pectoral 1.85 to 2.1. Eye in head (measured without rostral processes and to end of opercular spine) 4.2 to 4.6; snout 2.4 to 2.7; mandible 3.0; interorbital 5.0 to 5.8. D. X or XI-11 or 12; A. 9 or 10; P. 11 or 12 + 3; scales about 55 to 60; gill rakers short, 8 or 9 on lower limb of first arch.

Gulf of Mexico, in rather deep water.

S. F. H.

Family DACTYLOPTERIDAE. FLYING GURNARDS

Dactylopterus Lacépède

Cephalacanthus Lacépède, Hist. nat. poiss., vol. 3, 1802, p. 323 (*C. spinarella* Lacépède).

Dactylopterus Lacépède, *ibid.*, p. 325 (*D. pirapeda* Lacépède = *Trigla volitans* Linnaeus).

Cephacandia Rafinesque, Anal. nat., 1815, p. 85 (substitute for *Cephalacanthus*).

Gonocephalus Gronow, Cat. fishes (ed. Gray), 1854, p. 106 (*G. macrocephalus* Gray = *Trigla volitans* Linnaeus).

The last two generic names in the list above have long been counted synonyms. But each of the first two has indifferently been counted good or rated a synonym without adequate statement of reasons.

Cephalacanthus has page priority in the original. But Owen (Anatomy of vertebrates, vol. 1, 1866, p. 612) first stated definitely, on the authority of Albert Günther, that *Cephalacanthus* is merely the young of *Dactylopterus*, and later

(*ibid.*, vol. 3, 1868, p. 876) definitely referred the first to synonymy under the second name. Since Günther's view was correct (see Canestrini, Arch. zool., vol. 1, 1861, p. 45; Lütken, Spolia atlantica, 1880, p. 590), *Dactylopterus*, by choice of the first reviewer, whether Owen or Canestrini, becomes the correct name of the genus.¹

W. H. L.

***Dactylopterus volitans* (Linnaeus)**

The young, up to 45 mm., were included in the waste of the tern colony. They also came at night to a submerged light south of Tortugas, where 6 were taken in about an hour.

It may rest on the bottom on the tips of the ventral and anal fins, or "walk" forward or backward equally well by advancing or withdrawing one ventral and the other alternately. The small anterior lobe of the pectoral, with 5 short rays, may be moved independently of the great posterior lobe, with 30 rays, of which the longest is more than half the total length of the fish and reaches base of caudal.

It has been said at least since the time of Artedi that this fish flies. The statement seems scarcely credible, as the rays of the pectoral are so thin and flexible that the fin droops almost of its own weight.

Adults reach a length of at least 300 mm., and are so rare that I have noticed little more than that their coloration is changeable. Their shade varies with that of their surroundings. They rest in a pattern of bands. In the aquarium the anterior pectoral lobe is always expanded, with upper surface mottled or marbled in colors like those of back; posterior lobe trailed strapwise by the side like a folded fan, thrust straight out from the side still closed, or flung wide open with its rays extended and all its membranes taut. The folded fin is marked from border to border with dark and light bars quite sharply defined; the open fin with a broad dark field, half the whole fin surface, with perhaps two lines of vivid blue concurrent with one another and with the fin margin, and with several rows of blue spots nearer base of fin, the light spots, which form bars in the closed fin, now well separated. In a half-grown specimen, the under side of the pectoral was slightly dusky toward the outer and inner borders of the great lobe, the median sector most brightly colored above and unspotted white underneath.

W. H. L.

In a small specimen, 52 mm. long, the pectoral fins are scarcely enlarged, reaching only opposite the 3d or 4th ray of the second dorsal. In a specimen 85 mm. long, however, they already reach somewhat beyond the base of the caudal.

On both coasts of the Atlantic.

S. F. H.

Family POMACENTRIDAE

***Chromis multilineatus* (Guichenot)**

Several full-grown individuals were seen at two widely separated stations on rocky bottom east of East Key, and only 3 small ones about Loggerhead Key.

Color grayish; creamy spot as large as pupil on caudal peduncle just behind

¹ For information in this paragraph I am indebted to Dr. G. S. Myers.

base of soft dorsal. Margins of dorsal and anal fins and tips of caudal lobes orange; outer rays of caudal black; axil of pectoral black, with pigment extending to anterior face of base of fin. The fish shows an apparent tendency to be darker in holes than in the open.

Atlantic coast of tropical America northward to Florida.

W. H. L.

***Chromis enchrysurus* Jordan and Gilbert**

This species was taken only once, when 20 specimens, 75 to 115 mm. long, were secured in one haul with the otter trawl in 40 fathoms.

The fish were slaty blue on the back, and the soft dorsal, caudal, anal, and pectorals were yellow.

The specimens were taken on August 4, 1931, and were in breeding condition.

W. H. L.

Two additional records were found, however, among Dr. Longley's field data, perhaps made after the foregoing was written. Three specimens, 62 to 106 mm. long, were taken south of Tortugas in 40 fathoms, and in another haul 10 more, 58 to 93 mm. long, were secured at the same depth.

Gulf of Mexico, off Florida.

S. F. H.

***Chromis insolatus* (Cuvier and Valenciennes)**

Common on rocky bottom east of East Key, and near the northern end of Loggerhead reef, but rather rare elsewhere.

Color bluish, though variable in shade; sometimes clear and bright, sometimes almost black and appearing blue ventrally only. It has a white-spotted phase in which there is a white bar on the nape, a white spot under the spinous dorsal, and a larger one below the point of union of spinous and soft dorsal fins.

The teeth are fixed, conical, and in several rows; D. XIII, 13; A. II, 12; pectoral reaching base of anal.

Toward the end of June 1927, a dozen displaying signs of breeding were visible at once at Loggerhead shoal. The condition of the ovaries of a speared female confirmed the view that breeding was in progress. At East Key on July 2 on rocky bottom, in perhaps 15 feet of water, fish showing signs which indicated breeding were seen. Two fish displayed breeding colors, and a proprietor's interest in areas sharply defined. I cut out the nests, which were in holes in rocks. I could find nothing, even on viewing the chips of the nests through a reading glass, but the fish were so positive in their reactions and rushed in with such spirit to drive away marauders that I gathered up all in a pail and brought them in. On microscopic examination it became clear that the eggs were hard to find because they were not closely enough concentrated to form masses like those of *Abudefduf* and *Pomacentrus*.

On July 18 breeding apparently continued, as a fish, appearing to guard eggs, fed above the spot where they should have been hidden, went into its shelter and fanned the spot where the eggs presumably lay, and persisted in the same round of activity as long as observed. On July 27 some individuals were seen as if still guarding eggs. The duration of spawning, however, was not determined.

The eggs are almost perfectly ellipsoidal. Laid end to end, 10 in a row, they measure 6.0 mm., and 10 laid side by side measure 4.5 mm. The egg envelope is transparent, is attached to the substratum by a tuft of a few long, delicate filaments grouped in a small area at one pole, and has a single large oil globule in its straw-colored yolk.

West Indies to Florida.

W. H. L.

Pomacentrus Lacépède, 1803

There has been, and apparently still is, uncertainty concerning the relationship of the species of this genus. Bewilderment has been expressed by several investigators. Parr (Bull. Bingham Oceanog. Coll., vol. 3, art. 4, 1930, pp. 67-84) took cognizance of this confusion, and made an extensive study of a considerable number of specimens available to him. He came to the conclusion that *planifrons* and *partitus* were of specific rank. As for the rest of his material, he was unable to arrive at a definite conclusion.

Dr. Longley, too, took cognizance of the inadequate knowledge of this group of fishes, and accordingly made careful field observations, and examined many specimens in American and European museums, with a view to discovering distinctive structures, color, and habits. The result was that he recognized four or five species in the Tortugas fauna. These include the two, *planifrons* and *partitus*, also recognized by Parr, and two others, *leucostictus* and *adustus*. Apparently he recognized a fifth one, *xanthurus*, which he mentioned a few times in connection with other local species in the accounts that follow. He prepared no discussion, however, and has no notes under that name. In his copy of Jordan, Evermann, and Clark's *Check list*, wherein (p. 413) this name is in the synonymy of *leucostictus*, he has the marginal note in regard to *xanthurus*, "A good species," and he has given it a serial number, as his custom was for species occurring at Tortugas.

Though Dr. Longley took a few names out of synonymy, he also placed several others in synonymy, for which he stated his reasons. The conclusions given may not have been considered final by him. They seem well worthy of consideration, however, as it seems certain that headway toward a better understanding of the local species of this group has been made.

The following note was found among Dr. Longley's papers: "The difficulty that students have experienced is largely due to the fact that some of the species change greatly in appearance with age, that individuals display temporary changes in coloration, and finally that in one species at least sexual dimorphism in color occurs."

Many specimens are included in the Tortugas collection, all of which, exclusive of one specimen of *partitus*, reached me without labels. As the specimens have faded, I have found it very difficult to identify some of them, even with Dr. Longley's discussions before me. "Extremes" are not especially difficult to identify, but "intermediates" are included that caused trouble.

I am not certain enough of the specific differences to offer a key. I believe that the number of pectoral rays usually will distinguish *adustus* from the other local species. In 17 specimens that appeared definitely to be of this species by the depth

of body and color, the pectoral had 20 and 21 rays about evenly, and 1 had 22, whereas in 20 specimens of the other species this fin had 18 or 19 rays, except that 2 of 13 specimens of *planifrons* each had 20. Aside from the rather slender body and distinctive color, *leucostictus* may be recognized by the stronger serrations on the preopercular margin, which is not covered to the edge with scales as in the other species.

According to Dr. Longley's observations, all the local species deposit their eggs on or in some solid object, to which they become attached by adhesive threads. There they are closely guarded by a parent fish, which apparently always is the male.

S. F. H.

***Pomacentrus adustus* Troschel**

Pomacentrus adustus Troschel, in von Müller, Reisen in den Vereinigten Staaten, Canada, und Mexico, vol. 3, 1865, p. 633—Atlantic Ocean.

Pomacentrus dorsopunicus Poey, Repertorio, vol. 2, 1868, p. 328—Havana.

Pomacentrus obscuratus Poey, Enumeratio, 1875, p. 101—Havana.

Eupomacentrus diencaeus Jordan and Rutter, Proc. Acad. Nat. Sci. Philadelphia, vol. 49, 1897, p. 116—Jamaica.

Eupomacentrus fuscus Jordan and Evermann (part not of Cuvier and Valenciennes), Bull. U. S. Nat. Mus., No. 47, pt. 2, 1898, p. 1552—West Indies.

Eupomacentrus rubridorsalis Beebe and Hollister, Zoologica, vol. 12, 1931, p. 85, fig. 16—Chatham Bay, Union Island, Grenadines.

Common about the larger coral stacks.

Although this species has not always been distinguished clearly from others, it has generally been referred to as *Pomacentrus* (or *Eupomacentrus*) *fuscus*. I think, however, that it is not the Brazilian form described by Cuvier and Valenciennes (Hist. nat. poiss., vol. 5, 1830, p. 432). The true *fuscus* is a larger fish, commonly attaining a length of 120 to 130 mm., whereas this species scarcely exceeds 100 mm.

For this northern species, if it be distinct, there is no earlier name than Troschel's, and the identity of his *P. adustus* with this one must next be determined. On this point it was impossible to obtain light from examination of the type, as it now (May 1935), at least, is not to be found in the Berlin Museum. The published description, however, is conclusive on some points.

The type had a black spot on the upper side of the caudal peduncle. It therefore belonged neither to *P. leucostictus* nor to *P. partitus*, and Troschel's *P. flaviventer* belongs to neither for the same reason. But from the published description, *P. flaviventer* is recognizable. The spotting with bluish white on the head and below the dorsal fin, the dark saddle on caudal peduncle, and the brown color above, passing gradually to yellow below, identify it.

Now *P. adustus* can scarcely be the same as *P. planifrons*. At the time the latter species shows its dark saddle on caudal peduncle, it also shows a dark spot on the dorsal fin and back, which could scarcely have been overlooked. It is also, at least in early life, a yellow fish. By the time its dorsal ocellus and yellow color are lost, it should scarcely show even such traces of blue spotting as Troschel mentions.

Its lack of yellow and its less evident blue spotting tend to distinguish *P. adustus* from *P. xanthurus*, an earlier name for *P. flaviventer*. Finally, the difference in ratio of depth to total length which Troschel gave for the two agrees almost precisely with that between a 63-mm. specimen of the species here called *adustus* and one of *P. xanthurus* a little larger. At a length little exceeding 70 mm., I think, in the course of normal development the ocellated black spots are merged in the dark ground color.

Poey's description of *P. dorsopunicus* is brief: Its color is blackish. As seen in the water, it has a beautiful blue sheen. The upper and anterior surface of the head and back are red, as is the corresponding part of the dorsal fin. There is an ocellated spot on the dorsal; the caudal fin verges toward yellow. The length is 40 mm.

Beebe and Hollister's *Eupomacentrus rubridorsalis*, I think, is the young of *P. adustus*, described with greater attention to detail. I am unable to fit into any consistent whole the observations of Beebe and Hollister on their new species. They state categorically that it is not a growth stage of any other, but this is not inferred from the presence of ripe germ cells in specimens in hand. Others seen but not captured, they suggest, behaved like adult *Pomacentrus* and so declared their standing. But there is no reason to believe that the male and female *Pomacentrus* are more than momentarily paired, no ground for supposing that being paired, the female shares with the male the responsibility for guarding their young. Without very much more precise observation these authors' position cannot be successfully maintained.

Pomacentrus obscuratus is a name given by Poey in 1875 to no. 586 of his collection, which in *Reportorio* (vol. 2, 1868, p. 327) was listed as *Pomacentrus* species dubia. The types were sent to the Museum of Comparative Zoölogy under the manuscript name *P. lineatus*. They are still in the collection and are representative specimens of *P. adustus*.

Depth in standard length in adults about 2.0. Scales with pores in lateral lines, in 40 specimens, 19 or 20; marginal series of scales on preopercular borders normally developed.

In young fish the markings on the head do not include a pair of lines on the upper side of the snout, but only small round dots of blue, or of white in alcoholic specimens, there and in the interorbital space. Adults are variable in coloration, both shade and pattern being changeable. The black may lighten to dark gray generally or locally. In the latter case a median light stripe may run from the interorbital space to nape and back, or there may appear merely a light spot on the nape, and one on the side under or before the middle of the dorsal fin, with some lightening of the color posteriorly.

Germ cells are fully matured at least by the first of June. Reproduction continues actively in August, but the actual length of the breeding season is not known. The favorite breeding ground appears to be rocky bottom about the greater coral stacks. Here, usually well hidden from view, the eggs are deposited in patches several inches in diameter. They measure from 0.74 to 0.81 mm. by 0.47 mm. Their yolk is yellow.

W. H. L.

This species, as stated (see p. 177), usually seems to have 1 or 2 more rays in the pectoral fin than the other species.

Bermuda and Florida to Panama.

S. F. H.

***Pomacentrus partitus* Poey**

Pomacentrus partitus Poey, Repertorio, vol. 2, 1868, p. 327—Cuba.

Pomacentrus freemani Beebe and Tee-Van, Zoologica, vol. 10, 1928, p. 196, with fig.—Port-au-Prince Bay, Haiti.

One specimen, 100 mm. long, was taken in 40 fathoms. Others, sometimes singly and rarely more than 2 or 3 together, were seen about the shoals, reefs, and elsewhere. Once only it was found in relative abundance, when it was breeding in 12 to 15 feet of water; a dozen were visible in a small area northwest of Southwest Key.

Commonly the body and vertical fins are black to base of 1st ray of soft dorsal and to anal ray 4th from last; the remainder of dorsal and anal fins and the entire caudal white; pectorals yellow, narrowly black on base, with no black in axil, and no black spots or ocelli anywhere. Of 2 seen together, 1 was much lighter over the fore part of the body. The belly is sometimes light as well as the hind part of the body, of which the hue may be creamy instead of white, and verge toward yellow on the lobes of vertical fins.

The eggs are guarded as usual in this genus. One nest was hidden away in a millepore base standing on a coral head a yard high. The eggs were attached by filaments in a tuft at the larger end. They were almost transparent, faintly straw-colored; and were 0.74 mm. long, and in greatest breadth 0.43 mm.

West Indies to Florida and the Bahamas.

W. H. L.

***Pomacentrus planifrons* Cuvier and Valenciennes**

Pomacentrus planifrons Cuvier and Valenciennes, Hist. nat. poiss., vol. 5, 1830, p. 431—Martinique.

Eupomacentrus chrysus Bean, Proc. Biol. Soc. Washington, vol. 19, 1906, p. 32—Whites Flat Channel, Bermuda; Field Columbian Mus., Zool. Ser., vol. 7, 1906, p. 61, fig. 4.

Fairly common; almost confined to coral.

The young are saffron yellow with one large black spot on dorsal fin and back, and another forming a saddle above lateral line on caudal peduncle. The anterior one is bisected by the 1st soft ray of the dorsal; both may be ocellated or semi-ocellated with blue. Blue spotting in general is much less conspicuous than in *Pomacentrus leucostictus* and *P. xanthurus*. Very early in life dusky lines following the oblique scale rows down and forward begin to dim the yellow of back and side. At last all goes except a spot above eye and a narrow bar behind pectoral base. The black of the adult, though somber, is more lustrous than the black of *P. adustus*. It is not very changeable, nor yet wholly stable, as in fish which are chasing or being chased the color may pale dorsally.

The eggs of this species measure about 0.9 by 0.45 mm. Each contains an oil droplet about 0.25 mm. in diameter. In early stages of development they are almost colorless, and similar to those of *P. xanthurus*. The behavior of the guardian *planifrons* male proved so informative that the eggs came promptly to

light. The first clutch discovered composed a smear several inches in diameter on the under face of a head of *Orbicella annularis* below the mantle of living polyps. Later in an *Acropora* thicket, with many others, eggs of one lot were found in three discrete patches of about 3 by 2 inches on the under side of as many lateral branches springing together from one main stem.

West Indies to Florida.

W. H. L.

***Pomacentrus xanthurus* Poey**

Pomacentrus xanthurus Poey, Memorias, vol. 2, 1860, p. 190—Cuba.

Pomacentrus flaviventer Troschel, in von Müller, Reisen in den Vereinigten Staaten, Canada, und Mexico, vol. 3, 1865, p. 633—Atlantic Ocean.

Dr. Longley prepared no discussion, and I have found no notes definitely referable to it. However, he indicated in his copy of Jordan, Evermann, and Clark's *Check list* (1930) that it belongs to the Tortugas fauna, as explained in the discussion under the generic name. Virtually positive evidence that he observed it at Tortugas is found in the discussion under *Pomacentrus planifrons* (p. 180), where he compared the eggs of that species with those of the present one.

Some further information concerning this species is to be gained from comparison of the color with that of *planifrons* and *leucostictus* (p. 180) and of *adustus* (p. 179). Information concerning the number of scales with pores in the lateral line and on the preopercle appears in the discussion of *leucostictus* (p. 182), and concerning the proportionate depth of the body under *adustus* (p. 179).

If I succeeded in identifying the specimens in the collection correctly, this species is close to *planifrons*, from which it differs chiefly in color and in the more slender body, though there seems to be overlapping.

In the discussion of *P. adustus* (p. 178) Dr. Longley said of the type of *P. flaviventer*, which he regarded as a synonym of this species, "The spotting with bluish white on the head and below the dorsal fin, the dark saddle on caudal peduncle, and the brown color above, passing gradually to yellow below, identify it."

Atlantic coast of Mexico, West Indies, and Florida.

S. F. H.

***Pomacentrus leucostictus* Müller and Troschel**

Pomacentrus leucostictus Müller and Troschel, in Schomburgk, Hist. Barbados, 1848, p. 674—Barbados.

Pomacentrus atrocyaneus Poey, Memorias, vol. 2, 1860, p. 190—Cuba.

Pomacentrus analis Poey, Reportorio, vol. 2, 1868, p. 327—Cuba.

Pomacentrus nepenthe Nichols, Amer. Mus. Nov., No. 26, 1921, p. 1, fig. 1—Bahamas.

This is the commonest of Tortugas pomacentrids and has locally the widest range of all. On Loggerhead reef it occurs almost everywhere except in coral stacks and dense stands of *Acropora*, and it is one of the commonest fishes in tide pools on Bird Key reef.

This is a slighter fish than others with which it has tended most to be confused. In 3 adult females the depth enters 2.25 to 2.28 times into standard length, and in 3 males 2.31 to 2.34 times; scales with tubes in lateral line rather more

variable in number than in *Pomacentrus adustus*, as in a total of 72 the number varied from 17 to 21. The arrangement of scales on the preopercle provides the most distinctive specific criterion (aside from color markings), the scales of the lowest row being very greatly reduced, or wholly lacking, leaving a broad border below and behind almost free of them, the three rows remaining with 4 or 5 scales each, or a scale or two less to the row than in *P. xanthurus*.

The young, down to 25 mm. or less in length, are abundant in early June. From much blue spotting they are bright blue anterodorsally and shade gradually to yellow posteriorly and ventrally. An imaginary line from the base of the 4th dorsal ray, tangent to the eye below, approximately separates the two color regions. A pair of blue lines runs from the tip of the snout toward the upper orbital margin. On the soft dorsal, high above its base and just behind the last spine, is a dark blue spot ocellated with lighter blue. As the fish grows, this gradually becomes diffuse and is at last lost in the dark ground color. Neither adult nor young has at any time a dark spot on the dorsal side of the caudal peduncle.

Adult males are larger than females and differ from them in coloration, commonly being bluish black, with more or less evident brassy spots on the scales of the lateral line and those above it. The females are browner, with the lobes of the dorsal and anal and the entire caudal yellow, inclining toward orange. The blue spotting in both sexes may be relatively inconspicuous in mature fish, but preservation in alcohol brings it to view again, whereas formalin is likely to leave it obscure. At night the sexes become alike in appearance, both becoming uniform gray above. The light color extends from the eye posterodorsally to mid-level on the side, straight back, and then upward just behind the soft dorsal; anterior margins of pectoral, anal, and soft dorsal blue; a blue sheen on the soft dorsal, anal, and caudal.

The female deposits her eggs in places of divers sorts, such as empty *Strombus* shells, dead *Pinna* shells still standing with gaping valves, and natural or excavated shelters beneath corals living or dead; they were found also in empty tins and under masses of rusting iron.

Females may begin breeding at a length of 55 mm. The ovarian eggs vary much in size, which is consistent with a breeding season extending from June to August and probably much longer. The eggs are about 1.2 mm. long and 0.5 to 0.6 mm. in greatest diameter, circular in cross section, and bluntly rounded at the ends. They stand close together in a single layer and are attached to the substratum by a tuft of filaments at the animal pole. To the naked eye, in early stages of development they appear bright yellow. Microscopic examination shows that the color at first is localized in the blastodisk, later pervading all the developing germ. The yolk is coarsely granular and colorless. Embedded in it toward the outer pole is a spherical opaque mass, 0.3 mm. in diameter, to the surface of which oil droplets adhere. The same female, or perhaps different ones, may lay in the same shell or other shelter at short intervals, for contiguous patches of eggs in as many as four stages of development have been observed.

The deposition of eggs is preceded by a display of mating reactions, glimpses

of which were caught several times. In one instance a fish smaller than an average adult was in a state of high excitement beneath a coral. In uniform dusky yellow-olive, except for a darker visor, it emerged and, dashing this way and that in broken curves, whirled about a larger individual in just such blue and gold as marks the young. By direct attack another was driven away. Shortly thereafter the fish became quiet and assumed its normal coloration. I believe that this was an unsuccessful attempt of the male to induce the female to enter and lay her eggs. I have also seen the blue-black male, with yellow spread over his dorsal surface only, go into a *Strombus* shell with a smaller fish, apparently a female, swim in and out several times while she remained, and then drive her away as she began to feed on eggs already there.

The eggs are the charge of the male alone. He is in the highest degree intolerant of the approach of fish of his own or other species, which he pursues and nips whenever they draw near. Except as his pugnacity may be increased, his behavior during the breeding season seems little changed. He feeds freely while on guard, but is true to his trust and eats no eggs. He keeps his shelter unencumbered by material which may fall or float in and interfere with free passage to or from it. One was found removing bits of algae which ground swells washed into the hole it was occupying. When a mass of *Sargassum* composed of pieces several inches long was thrust in to test its reaction, it worked continuously for 5 to 10 minutes clearing the opening, interrupting its labor repeatedly to drive away small *Halichoeres*. It also carried out sand in its mouth. Repeated trials showed that nest cleaning is a habitual response.

The stereotyped form of the instinct of guarding the nest may also be readily demonstrated. A *Strombus* shell containing eggs was removed only a yard from its original place. Many *Halichoeres bivittatus* were drawn at once to the spot by the disturbance. The guardian male, greatly excited, kept all fish away from the original site, but paid no attention whatever to those swarming about the shell in its new location, greedily devouring eggs and larvae. When the shell was placed at a point only 18 inches from its first position, care for it was renewed. This care continued when it was set a yard away for the second time, but the original site exercised a persistent influence on the fish's behavior, and sustained effort was made to preserve both from invasion. A fish picked up with its shell, and carried away as far as 40 feet, may when liberated go straight to the spot from which it came, its sense of direction being excellent, or its acquaintance with the ground about its station detailed. Fish disturbed by such testing of their homing powers may eat their eggs, and eggs in shells exchanged are eaten as a matter of course.

West Indies to Florida, sometimes straying northward.

W. H. L.

***Abudefduf saxatilis* (Linnaeus).** SERGEANT MAJOR

(Plate 24, figure 1)

Chaetodon saxatilis Linnaeus, Syst. nat., 10th ed., 1758, p. 276—"India"; *ibid.*, 12th ed., 1766, p. 466—Brazil.

Chaetodon marginatus Bloch, Naturgesch. ausland. Fische, vol. 3, 1787, p. 98, pl. 207—Martinique (after a drawing by Plumier).

Chaetodon mauriti Bloch, *ibid.*, p. 109, pl. 213, fig. 1—Brazil (after a drawing by Prince Maurice).

Chaetodon sargoides Lacépède, Hist. nat. poiss., vol. 4, 1803, pp. 471, 473, 543—Martinique.

Glyphisodon moucharra Lacépède (part), *ibid.*, p. 543—Brazil.

This fish some recent authors have called *Abudefduf marginatus*, on the ground that the older name *A. saxatilis* belongs to an Asiatic species. In support of this view Linnaeus himself may be cited. In the *Systema naturae*, 10th edition (1758, p. 276) he noted his earliest mention of the species. At the same time he referred to synonymy *Sparus fasciis quinque* (Balk, in Linnaeus, Amoen., vol. 1, 1749, p. 312), also described without locality, and for the first time stated that the habitat is India. That this is not necessarily true would appear, however, from the fact that on the facing page he made the same statement regarding the American *Chaetodon lanceolatus*, now *Eques lanceolatus*. The critical reference is in the *Systema naturae*, 12th edition (1766, p. 466), where eight years later he extended his synonymy and observed that the species came from Brazil. He was aware that in the meantime Gronovius in the *Zoophylacium* (1763, p. 64) had identified *Chaetodon saxatilis* with the *Jaguacaguare* of Marcgrave and of Piso; Linnaeus approved this finding, and admitted his earlier error. W. H. L.

I strongly suspect that some of Dr. Longley's manuscript on this species was lost. All that I received is the foregoing. The following remarks were compiled from his field data:

This is a common fish found among the coral heads about the local keys, and also in some of the deeper holes in 15 feet or more of water. It does not stay as near the bottom as *A. taurus*; it often swims high and at least once was seen breaking the surface.

Its food, according to 3 stomachs examined, consists largely of algae, mixed with some copepods. One had eaten a pelagic fish egg.

The fish commonly are seen in two color phases, a light and a dark. The light phase was observed when the fish were feeding over light sandy bottom, or when swimming high above coral heads. The fish showed the dark phase when among dark crevices among corals, and especially when in deep water. The light phase is light gray; head slaty with greenish tinge; body with five dark vertical bands on sides; upper third of body yellowish; soft dorsal, caudal, and anal dusky. In some individuals the suborbital region may be yellowish, giving the effect of a light spot. In the dark phase the fish is blue to slate gray, with all fins, except pectorals, slaty; five vertical bands slaty black. A few large individuals observed in water 10 to 12 feet deep, in crevices, were so dark that the bands were scarcely visible.

The fish can pass almost instantaneously from one phase to the other. Those swimming near the surface showed the maximum of yellow. A fish kept in a tank became quite yellow when excited, as when an attempt was made to catch it. When left at rest, it again became darker.

Spawning was observed repeatedly. The breeding season extends at least through June, July, and August. The eggs are attached in a single layer by

adhesive filaments to corals, generally on an eroded overshadowed surface, though once two nests were found on the upper surface of bare rock lying on the bottom. The "nest" may cover an area about a foot in diameter.

The nests are guarded by a parent fish. The three captured while performing this duty were all males. These fish evidently have no easy task, as they were kept busy during the observations, dashing wildly, driving away small (young) *Halichoeres bivittatus*, *Thalassoma bifasciatum*, *Pomacentrus* sp., *Malacoctenus* sp., and *Rupiscartes atlanticus*. One fish may guard three or more different clutches of eggs during a single season. This was learned through the observation of a fish with a malformed profile, that appeared on duty among the same coral heads two seasons in succession. One season, when it was watched rather closely, it guarded at least three different clutches of eggs in the same place between June 27 and July 24.

Only once two fish were seen together at one nest, the one much smaller than the other. As the larger fish, 150 mm. or so in length, remained to guard the eggs, and the smaller one was seen there only this one time, when it was more than tolerated, it is assumed that it was a female. It was not actually seen in the process of depositing eggs, but it seemed to be engaged in cleaning the nest, or the surface on which eggs were to be deposited.

The eggs are longer than broad, and a little larger at one end than the other, but depart little from an ellipsoid form. The greater axis of the egg is approximately 1 mm., and the cross axis at mid-length of the egg is about half that length. The adhesive threads spring from the larger end of the egg. Its color is rose red. In the nest under water the eggs were of a muddy amethyst color. Under the microscope the yolk is a vivid purple. Each egg contained one large and a varied number of smaller oil globules of different sizes.

The length of the period of incubation was not definitely determined. Eggs brought to the laboratory died before hatching. Eggs in an advanced cell division stage when first observed in nature had hatched 5 days later. The incubation period, then, apparently extends over 5 or possibly 6 days.

Atlantic coast of tropical America northward to Florida, sometimes straying as far north as Cape Cod.

S. F. H.

Abudefduf taurus (Müller and Troschel)

(Plate 24, fig. 2)

Glyphisodon taurus Müller and Troschel, in Schomburgk, Hist. Barbados, 1848, p. 674—Barbados.

Glyphisodon rudis Poey, Memorias, vol. 2, 1860, p. 191—Havana.

Rare at Tortugas, a dozen or two individuals of all ages apparently representing it during a large part of the year. Its distribution, however, is so precisely correlated with a particular sort of habitat that few species may be more surely discovered at will and studied at leisure. It was seen only at the shore, and then under natural conditions only where blocks or sheets of beach rock on the east or west side of Loggerhead Key afford shelter. About Garden Key a few were usually found where tracks for hauling out boats or where horizontal pipes not

resting on the bottom entered the water, or, again, about the bases and in the crannies of the concrete foundations of the old coal sheds.

On one occasion 3 adult and 1 partly grown one, and several young *A. saxatilis* were under continuous observation side by side for several hours. On the sloping beach rock where they were, two plant associations might be readily distinguished. In an upper zone, nearer the shore, *Cladophora* and *Ectocarpus* were dominant; in a lower zone *Laurencia* predominated. Seaward from the rock was a strip of bare white sand. While watched, not one *A. taurus* ventured into the upper zone, but freely fed from the bottom, browsing greedily as *A. saxatilis* never does; the latter, on the contrary, rose readily from the bottom, which *A. taurus* hugged closely. In conformity with the difference in instinct exhibited, *A. taurus* rarely swims over an obstruction under which it is able to pass, whereas *A. saxatilis* at times swims freely at the surface. W. H. L.

The following notes on color were extracted from Dr. Longley's field data, based on under-water observations: It is a dual-colored fish, being obliteratively shaded with sepia and bands of cream color or vice versa. It has a light line extending from the gill opening to the occiput, where it meets its fellow of the other side. The first dark crossbar is broader dorsally than ventrally and is margined on both sides with pale color. The dark bars become paler on the lower part of the side, and do not continue ventrally. Pectorals transparent; other fins more or less ashy.

The collection contains no specimens. Aside from the differences in color mentioned, I judge from an under-water picture that *A. taurus* has a less deeply forked caudal than *A. saxatilis*. Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 245) stated, "Dusky bands fainter than in *Abudefduf marginatus* [= *saxatilis*], twice as broad as the interspaces and growing fainter below; a faint band on caudal peduncle, making 6 dark bands in all; fins all dusky. This species is distinguished from *A. marginatus* by the larger scales, the much broader, fainter crossbands, of which 6 rather than 5 are distinct, and the rather broader preorbital."

West Indies to Florida.

S. F. H.

Stegastes chrysurus (Cuvier and Valenciennes)

Glyphisodon chrysurus Cuvier and Valenciennes, Hist. nat. poiss., vol. 5, 1830, p. 476—St. Thomas.

Pomacentrus denegatus Poey, Memorias, vol. 2, 1860, p. 190—Cuba.

Pomacentrus niveatus Poey, Enumeratio, 1875, p. 102—Havana.

Common, although more than 3 or 4 are not often seen together. It haunts the coral stacks, away from which it scarcely ventures.

It browses on the delicate algae covering dead coral surfaces.

A single fish may in a few moments vary in color from faded russet to deep brown, almost black, rich and lustrous. The tail of the adult is yellow in all phases, but in the young, approximately 60 mm. long, it is colorless. The ground color in the young (*Pomacentrus niveatus* Poey) is paler and bluer than in the adult, and is profusely dotted (body and fins) with more metallic blue. These

spots persist in fish of breeding age, and less distinctly in fish which have attained their maximum size.

The breeding season is probably a long one, since during one summer the apparent young of the preceding season may be observed in a considerable range of sizes from perhaps an inch upward. A female with conspicuous friable roe was taken on July 7. The guarded eggs were found as early as June 7 and as late as August 2, though breeding apparently extends far beyond this last-named date, as is shown below.

The nesting site selected for the eggs found July 17 was near the top of an isolated *Orbicella* head about 6 feet high, in 10 to 12 feet of water. The eggs were affixed to the naked branches of a gorgonian skeleton still standing where it had grown. The two chief branches bore most of them. Those on the one had been very recently deposited, those on the other were near hatching. The two branches were rather uniformly covered by the eggs for a length of 5 or 6 inches each. At the time of deposition, they had manifestly been united by their polar filaments in strands like plaited ropes of onions or firecrackers, and were disposed chiefly in series running lengthwise on their support. On August 2 another deposit was found smeared on bryozoans encrusting coral in the mouth of a hole leading deep into a great isolated head, and August 21 several fish were seen dashing out wildly from fixed posts. It seemed as though the height of the breeding season had perhaps arrived.

The egg measures 0.9 by 0.5 mm., and is distinctly broader basally than distally, its diameters at a distance of one-quarter and three-quarters the length of the polar axis from the point of attachment being to one another as 8 to 7. The protoplasm nearly fills the chorionic envelope. The egg is grayish and coarsely granular, and usually contains a large orange oil globule, measuring 0.15 to 0.18 mm., with many smaller ones up to 0.002 mm. in diameter, the large one occasionally being replaced by two, and very variable in position. The color of the newly laid eggs, as seen in mass, is buff.

The guardians of the eggs were not secured. The length of the one first found was between two-thirds and three-quarters that of the largest one seen. Its blue spotting was brilliant on a ground of brown inclining to violet, its tail bright yellow. It kept watch with all the alertness of *Pomacentrus* and *Abudefduf*. The young of *Thalassoma bifasciatum* were attacked with spirit, as if particularly dangerous.

West Indies to Florida.

W. H. L.

Family LABRIDAE

Lachnolaimus maximus (Walbaum). HOGFISH

(Plate 25, figures 1, 2)

The hogfish is common and widely distributed over the reefs, occurring singly or in twos and threes. The haunts of this species are the comparatively open spaces. Coral stacks have no attraction for it; it is rare on the large areas of bare sand, and occurs most commonly wherever gorgonians grow well, beneath which it usually rests.

It feeds freely by day. Whether it feeds also at night is not known. Broken univalve and bivalve shells and bits of the test and spines of *Echinometra* have been taken from its stomach.

This fish at a length of 30 mm. has a truncate caudal fin, anterior dorsal spines not elongated, and a banded color pattern only; a dark saddle just before the dorsal, surrounded by a narrow light blue line, almost divided transversely by another narrow blue line; a second somewhat smaller blotch behind eye; an interorbital dark bar; two others across snout; an oblique line as wide as pupil from eye to angle of mouth, where it divides to pass to upper and lower lips; a second line extending downward and slightly backward from eye to margin of opercle; a transverse bar under jaw; two other dark lines extending from eye to opercle; a line, equaling in breadth those radiating from eye, from angle of preopercle to and across isthmus; another line extending from posteroventral angle of opercle across mid-line under throat; four dark zigzag bands across body and vertical fins; a black spot at base of last 6 rays of dorsal, lying in center of a dark area bounded by paler blue; caudal peduncle banded; outer rays of caudal pigmented.

The adult hogfish appears in several very different phases. The female may be uniformly gray except for her countershading. The male, according to age, may resemble the female, or it may show over the head a dark area from snout to base of 2d dorsal spine, and a black spot at base of last dorsal rays. It also has an essentially gray phase. In another phase the fish of either sex may be nearly uniform reddish brown. Between these two phases any gradation may occur. Finally, there is a phase in which the fish is irregularly banded with maroon and old ivory.

Hogfish commonly rest in the banded phase beneath gorgonians, or more rarely beside dead or living corals. When swimming they are self-color, except for the dark markings of the male already specified. Whether that self-color is light or dark depends on the color of the bottom and the distance the fish is above it, for a light bottom, or remoteness regardless of shade, stimulate the fish to display its lightest colors.

These fish may be led from place to place by offering them broken sea urchins, and their various phases may be evoked one after another in a few moments. Occasionally a fish feeds in the dark self-color, but when the bottom is variegated with light and dark objects, or with light and shadowy areas, it displays its banded pattern. If fed on bare bottom it displays the light self-color, although there is usually clear evidence of a tendency toward bandedness.

West Indies to the Bahamas and Florida.

W. H. L.

Decodon puellaris (Poey)

Cossyphus puellaris Poey, Memorias, vol. 2, 1860, p. 210—Havana.

Xyrula jessiae Longley, Carnegie Inst. Wash. Year Book No. 30, 1931, p. 386 (not of Jordan, which is *Xyrichthys psittacus*).

Four specimens, 40 to 150 mm. in length, were taken in 50 to 66 fathoms.

Maxillary and a horizontal preorbital line from eye to eye yellow; back faintly

rosy; dorsal fin yellow-margined; some yellow on caudal. The larger fish are pinkish above, with red blocks under dorsal fin supports 6 to 7, 10 to 12, and 17 to 19; upper lip narrowly margined with yellow; two rows of yellow spots on dorsal fin behind 6th or 7th spine, spots also on about three rows of scales on the sides, those below lateral line anteriorly continuing on caudal; anal spotted like dorsal, with yellow margin; caudal reddish dorsally; iris yellow-orange.

West Indies to Florida.

W. H. L.

Bodianus rufus (Linnaeus). SPANISH HOGFISH

Rare, at least in shallow water, as only 1 small and 1 medium-sized one were seen.

Of a general violaceous color above level of angle of opercle from eye to last dorsal spine; remainder of body largely yellow, shading into orange on anal and soft dorsal fins.

Atlantic coast of tropical America, northward to Florida.

W. H. L.

Halichoeres Rüppell, 1835

An attempt has been made to set forth in a key the principal diagnostic characters of the local species of this bothersome genus, as they were understood by Dr. Longley. The relative size and number of scales in advance of the dorsal fin is a character introduced by me. The color markings, as used in the key, are the "permanent" ones that at least usually are present also on preserved specimens.

S. F. H.

KEY TO THE SPECIES

- a.* Two canines anteriorly in each jaw, those in upper jaw large and strongly curved outward; scales in advance of dorsal greatly reduced, 7 or 8 oblique rows next to median line of nape; a prominent black lateral band, extending from snout through eye to and somewhat on base of caudal; a black spot on dorsal, between spines 5 and 7 . . . *maculipinna*
- aa.* Upper jaw anteriorly with 2 canines, lower jaw with 4, the upper ones not curved outward strongly
 - b.* Sides with 2 black lateral bands at all ages, the upper and most prominent one extending from snout through eye to base of caudal, the lower one from base of pectoral to base of lower rays of caudal, the latter often broken into more or less disconnected spots; scales in advance of dorsal scarcely reduced, 4 or 5 oblique rows next to median line of nape . . . *bivittatus*
 - bb.* Sides without black lateral band or bands
 - c.* A large black ocellated spot on anterior half of soft part of dorsal, extending on back in the young, sometimes replaced by a pale area slightly farther back in adults; a small black spot at base of caudal above lateral line, and sometimes with one or two small black spots on posterior rays of dorsal in young; scales in advance of dorsal somewhat reduced, 5 or 6 oblique rows next to median line of nape . . . *radiatus*

- cc. No large black ocellated spot on and under anterior soft rays of dorsal
- d. Body sometimes with a black vertical band extending across body under beginning of soft part of dorsal, the color anterior to band being yellow in life, pale in preserved specimens; color sometimes plainer, brownish above, pale below, with short dark lines on head, and black dots on head and nape; scales in advance of dorsal scarcely reduced, 4 or 5 oblique rows next to median line of nape *garnoti*
- dd. Body without dark crossbars; no dark stripes and spots on head and nape, rather plain grayish in alcohol, largely greenish in life
- e. A vertically elongate dark spot just behind eye, and a small round one at base of last ray of dorsal; caudal fin round in young, becoming straight with age, with acute but not produced outer lobes; scales in advance of dorsal scarcely reduced, 4 or 5 oblique rows next to median line of nape *poeyi*
- ee. No black spot behind eye, and none at base of last ray of dorsal, an indefinite one on opercle; margin of caudal straight, with the outer rays somewhat reduced; scales in advance of dorsal notably reduced in size, 7 or 8 oblique rows next to median line of nape *caudalis*

Halichoeres maculipinna (Müller and Troschel)

Iulis maculipinna Müller and Troschel, in Schomburgk, Hist. Barbados, 1848, p. 674—Barbados.

Iridio meyeri Bean, Proc. Biol. Soc. Washington, vol. 19, 1906, p. 29—Bermuda; Field Columbian Mus., Zool. Ser., vol. 7, 1906, p. 65, fig. 7.

Iridio microstomus Bean, Proc. Biol. Soc. Washington, vol. 19, 1906, p. 30—Bermuda; Field Columbian Mus., Zool. Ser., vol. 7, 1906, p. 67, fig. 8.

Halichoeres penrosei Starks, Stanford Univ. Pub., Univ. Ser., 1913, p. 59, pl. 7—Natal, Brazil.

Iridio similis Nichols, Proc. Biol. Soc. Washington, vol. 33, 1920, p. 61—Bermuda.

Iridio frenatus Nichols, *ibid.*

Found occasionally along the rocky shore of Loggerhead Key, rather more abundant and larger in the coral and gorgonian belt west and north of this key, and most numerous along the outer face of Bird Key reef, where the bottom is thickly strewn with small dead heads of massive coral, overgrown with *Sargassum* and the slit fronds of iridescent *Zonaria*.

The color of the bottom in the area just mentioned is prevailing brown, with which the hues of the fish agree. Over sand patches they are grayer than over other bottom.

On the head is a pattern of reddish lines; a dorsal stripe on body bounded ventrally by a glistening streak of distinctly yellow cast; ocular stripe not distinct from another through pectoral base, the lateral dark color fading gradually

toward the ventral white of the fish's countershaded body. In the young, before the pattern on the head is fully developed, with shimmering yellowish line.

W. H. L.

The colors mentioned by Dr. Longley have almost wholly faded in preserved specimens. The outstanding color now is a black lateral band extending from snout, through eye, to or somewhat on base of caudal; a black spot on dorsal fin between spines 5 and 7; a small black spot at last ray of dorsal; and another one at base of upper ray of pectoral.

The scales in front of dorsal are greatly reduced, with seven or eight oblique rows present next to mid-line of nape. In dentition it differs from the other local forms in having only 2 enlarged canines in lower jaw, whereas the others have 4. The 2 enlarged ones in upper jaw are peculiar in being curved outward very strongly.

Atlantic coast of tropical America to Florida, sometimes straying northward.

S. F. H.

***Halichoeres bivittatus* (Bloch).** SLIPPERY DICK

(Plate 12, figure 1; plate 17, figure 1; plate 19, figure 2; plate 25, figure 2; plate 32, figures 1, 2)

Although Dr. Longley listed many observations of this evidently very common fish, I have found no discussion among his manuscripts.

A note was found showing that Dr. Longley was in agreement with Mowbray (*Fauna bermudensis*, No. 1, 1931, no pagination, with plate) concerning the distinctness of this species, which had been placed in the synonymy of *Halichoeres radiatus* by some investigators.

This species inhabits grassy bottom, and also is common about coral stacks and gorgonians, and on alga-covered bottom. It was observed both in shallow and in rather deep water, that is, up to about 15 feet. In general it stays comparatively near bottom, and at night it apparently buries itself in sand.

The color is so variable and of so many shades that Dr. Longley found it difficult to describe them. In general, however, the fish is olive-buff above and pale underneath, and usually it has two distinct longitudinal bands on sides. It also has a phase in which it has about ten distinct dark crossbars between gill opening and base of caudal, and a less distinct one between gill opening and eye. In the longitudinally striped phase the two dark bands (the broader and more intense one extending from snout through eye to middle of base of caudal, and the other from base of pectoral nearly or quite to base of lower rays of caudal) may vary from vinaceous to seal brown. Pectoral fin transparent, entirely without color; dorsal and anal fins narrowly margined with pale blue, each with narrow bands of pink and pale yellow, and a row of slight yellowish to light spots; caudal marked with pale colors and with a broadly V-shaped vinaceous band with the apex directed backward, with two pale yellow stripes on each side of it, and other blue and pinkish bands, angles sometimes black; a vinaceous line extending from eye to nape; a spot of the same color just above and back of eye.

Concerning the two color phases Dr. Longley remarked, "I note that the fish so commonly show the banded pattern while resting on the bottom of the aquarium, and the striped one when swimming, that one might almost say that these two patterns are characteristic of a resting and an active stage." It was noted many times that the fish changed their shade according to the bottom on which they happened to be. If the fish were over a dark bottom they were darker and showed more reddish and pinkish color than when hovering over a light bottom. This color adaptation was tested in the laboratory, where the fish also responded.

"Mouth pushing," wherein two individuals meet with mouths wide open, was observed a few times. This mouth pushing is reported herein also for other species, especially for the grunts.

This species, according to the few stomach contents examined, seems to feed chiefly on fish. One individual had attempted to eat a pipefish, of which fully a sixth of the length projected from its mouth.

Ripe fish were reported twice, on July 26 and 27, 1929: 4 males, 85 to 125 mm. long, and 1 female, 82 mm. long. The ovary of this female contained "surprisingly few and surprisingly large eggs, each with adhering threads at one pole."

The scales in this species are scarcely reduced in size in advance of the dorsal, there being only four or five oblique series opposite the mid-line of the nape. According to Mowbray, whose paper is cited above, the two longitudinal dark bands are constant.

Atlantic coast of tropical America, northward to Florida and sometimes to North Carolina.

S. F. H.

***Halichoeres radiatus* (Linnaeus). PUDDINGWIFE**

Labrus radiatus Linnaeus, Syst. nat., 10th ed., 1758, p. 288—Bahamas (based on Catesby).
Iridio elegans Bean, Field Columbian Mus., Zool. Ser., vol. 7, 1906, p. 65, fig. 6—Bermuda.
Halichoeres irideus Starks, Stanford Univ. Pub., Univ. Ser., 1913, p. 60, pl. 8—Natal, Brazil. Parr, Bull. Bingham Oceanog. Coll., vol. 3, art. 4, 1930, p. 84.

Not common. Much the largest of the local species of its genus.

Juvenile coloration very bright, becoming more sober with age. In a specimen 45 mm. long the dominant color is dusky orange becoming more yellow on snout, throat, and breast; a pale blue band with average width of eye, extending from ventral margin of orbit to base of caudal; a transverse line of the same color before dorsal origin, two under spinous dorsal, one under spines 5 to 7, and another at end of base of dorsal; pectorals and ventrals pinkish; dorsal and anal red, with blue margins, and with a more or less continuous series of blue spots at base; a large ocellated black spot on anterior half of soft dorsal, extending on back; an unocellated black spot, nearly as large as eye, above lateral line at base of caudal.

Iridio elegans Bean, as has been observed by Mowbray (Fauna bermudensis, No. 1, 1931, no pagination), is a transition stage in which the finer markings of the young fish have disappeared and the dorsal ocellus has been resolved into a dark saddle.

W. H. L.

Dr. Longley apparently made no notes on the color of the adult, and there are no large specimens in his collection. Concerning this species Mowbray, whose paper has been cited, stated: "*I. radiatus* is a species more variable in color than any other of the genus known to me. It has from the earliest times been described under various names owing to its changes with age and depth of water in which it lives. There is a marked change of pattern as well as color, the most marked change being the black quadrate blotches on the back which disappear when the fish reaches between 8 and 11 inches. These blotches never appear in the adult, but the whitish areas that separate them in the young at times do."

Mowbray also stated: "One of the interesting habits of both species [*H. radiatus* and *H. bivittatus*] is that at sundown they burrow under the sand to sleep and remain there until daylight."

The scales in this species are somewhat reduced in advance of the dorsal, there being five or six oblique rows next to the median line of the nape. Two canines are present anteriorly in the upper jaw and 4 in the lower jaw.

Atlantic coast of tropical America, northward to the Bahamas and Florida.

S. F. H.

Halichoeres garnoti (Cuvier and Valenciennes)

Julis garnoti Cuvier and Valenciennes, Hist. nat. poiss., vol. 13, 1839, p. 390—Martinique. *Iridio decoratus* Bean, Proc. Biol. Soc. Washington, vol. 19, 1906, p. 29—Bermuda; Field Columbian Mus., Zool. Ser., vol. 7, 1906, p. 64, fig. 5.

A specimen about 125 to 150 mm. long was observed on rocky bottom east of East Key.

Anterior half of body of this fish was yellow; a black girdle about the middle a fingerbreadth wide; posterodorsal quadrant black like the girdle and continuous with it; posteroventral quadrant yellow, but not as bright yellow as the head. Later a second individual, larger than the first, was seen at the same place, and a third one outside Bird Key reef.

A specimen about 90 mm. long, from the western margin of Loggerhead bank, served to identify Bean's *Iridio decoratus*. This small fish was largely raw sienna above a line from angle of mouth to a point near end of dorsal base. It was lighter and more yellow below, with only a spot before eye, and three fine pencillings behind eye, with spots of the same dark color showing on the scales of seven series on either side of nape and on anterior base of dorsal.

Later the color proved to be variable in the aquarium. A dark band appeared under spines 6 to 9. The head above verged toward raw sienna, but its penciling and spotting remained unchanged. Below a horizontal line tangent to eye at its inferior margin the under surface as far as the dark girdle was largely bright yellow. Two blue bars on a pink ground were present beneath lower jaw. Behind the bar the body was more orange. From anterior margin of the bar to end of dorsal base the scales of the next row above lateral line each had a large pale blue spot. The caudal was rosy, with four or five pale blue lines crossing it.

W. H. L.

The collection contains a single specimen, 93 mm. long. This fish is now rather dark brown above lateral line, shading into pale brown to straw color below; an elongate dark spot on snout, just in advance of eye, and three broken wavy black lines behind eye. In addition, the top of the head, the nape, and upper part of side to base of 3d or 4th dorsal spine has distinct black dots.

The scales are scarcely reduced in size before dorsal, there being five oblique rows next to mid-line of nape. There are 2 canines anteriorly in upper jaw, and 4 in lower.

West Indies to Florida and Bermuda.

S. F. H.

Halichoeres poeyi (Steindachner)

Julis crotaphus Cuvier and Valenciennes (not of Cuvier), Hist. nat. poiss., vol. 13, 1839, p. 390—Bahia.

PlatyGLOSSUS poeyi Steindachner, (Sitzungsber. Acad. Wiss. Wien, vol. 56), Ichthyol. Notizen, No. 6, 1867, p. 49—Surinam.

Iridio kirschii Jordan and Evermann, Check list, 1896, p. 413—Bahia; Bull. U. S. Nat. Mus., No. 47, pt. 2, 1898, p. 1598.

This fish may be found singly, or by twos and threes, about Loggerhead Key, but is more abundant on Long Key flats and inside Bird Key reef. In spite of the fact that an occasional individual may be seen even on the isolated White Shoal, where no turtle grass occurs, its preferred habitat is in *Thalassia*.

The ground color, at a length of about 133 mm., is green above and yellow-green below; head with a median rosy line from dorsal origin through inter-orbital space, a pair of rosy lines running from tip of snout to upper border of orbit, and a spot of like color on upper surface of eye, a line of the same color running to lower border of orbit, another line extending from angle of mouth back to opercular cleft; a dark spot behind eye; a U-shaped mark open forward on opercle; a red streak following scale rows extending from upper margin of opercle up and forward to meet its fellow on nape; each scale on back and sides rosy on its posterior half, a few above pectoral fin blue at base, the rest green; an oblique rosy bar before pectoral running down and back to belly, bounded anteriorly by a faint blue line, and posteriorly on fin base by a brighter blue one; dorsal fin narrowly blue-margined, its ground color greenish yellow, with basal, median, and submarginal lines of rosy red; a small dark spot at base of last ray; anal with a fainter and narrower blue margin, rather less than its inner and outer thirds rosy, and an intermediate yellow stripe.

W. H. L.

The color has nearly all faded in 12 preserved specimens. The dark spot behind the eye, however, which is vertically elongate, remains. A more or less distinct dusky area is present on the tip of the snout, which is in part on the premaxillary, and every one of the 12 specimens at hand has a small but distinct black spot at base of last ray of dorsal.

The scales before the dorsal are not greatly reduced, there being five rows next to the mid-line of nape. The upper jaw has 2 canines anteriorly and the lower jaw has 4. The caudal fin is rounded in the smaller specimens, but in the largest

one (142 mm. long) the margin is straight and the angles acute, but not projecting.

This is the species listed as *Halichoeres kirschii* in most recent works. I compared the types (2 specimens) of *kirschii* with the specimens before me, with which they seem to agree perfectly.

The following proportions and enumerations are based on 4 specimens, 80 to 142 mm. long, from Tortugas: Head (without opercular lobe) 3.5 to 3.7; depth 3.8 to 4.0. Eye in head 4.8 to 5.7; snout 2.6 to 2.75; interorbital 5.7 to 6.3; caudal peduncle 5.7 to 6.3; ventral 1.75 to 1.8; pectoral 1.4 to 1.6. D. IX, 11; A. III, 12; P. 11 or 12; scales 2-26 or 27-8, before dorsal 4 or 5 (12 specimens counted).

Atlantic coast of tropical America northward to Florida.

S. F. H.

Halichoeres caudalis (Poey)

Julis caudalis Poey, Memorias, vol. 2, 1860, p. 213—Havana.

Iridio pictus Jordan and Evermann, Bull. U. S. Nat. Mus., No. 47, pt. 2, 1898, p. 1599—

Snapper Banks between Pensacola and Tampa, Florida (not certainly the same as *Julis pictus* Poey, Memorias, vol. 2, 1860, p. 214—Havana).

?*Iridio bathyphilus* Beebe and Tee-Van, Zoologica, vol. 13, 1932, p. 117.

Apparently rare at Tortugas, except perhaps at depths between 15 and 40 fathoms, where rough bottom has made it almost impossible to work effectively with available gear. A female from a 10-fathom channel, the only specimen taken alive, made it possible to study the coloration in life.

The proportional measurements of this fish were: Total length 120 mm.; standard length 100 mm.; depth 24 mm. (4.15); head without opercular lobe 26 mm. (3.8); eye a little less than 6.0 mm. (4.3 in head); caudal fin rounded mesially, its angles sharply exerted.

Upper side of snout, nape, and back pale olive; a narrow line of glistening bluish spots on first row of scales above lateral line, where the olive shades to orange; the orange passing to bluish along an irregular line at level of opercular angle; the blue growing exceedingly pale ventrally, broken only by a horizontal line of yellow passing back from pectoral axil; head above with light blue markings with metallic reflections, consisting of a line crossing snout and turning back just above orbital margin and joining blue line already mentioned, another line passing from middle of maxillary margin to lower border of orbit, reappearing as a postorbital dash enclosing a small dark spot, a third line extending from angle of mouth across cheek to upper angle of opercular cleft, a spot of blue at opercular angle, and a narrow line of blue on subopercular margin; additional blue about base of pectoral; a series of blue spots on the four rows of scales next below lateral line, two of these continuing on caudal peduncle; dorsal fin orange, rosy toward margin, with a submarginal blue line and two rows of blue spots; anal yellow, rose color distally, with a submarginal blue line, a median line, and a basal series of spots like those on dorsal; caudal bluish with yellowish upper and lower borders, marked with faint orange lines; pectorals essentially transparent; ventrals slightly rosy with bluish anterior border.

At rest this fish became distinctly banded, with ground color interrupted by a

series of pale bars of the approximate width of eye, the first running obliquely from just before dorsal origin to pectoral axil; the sixth under end of dorsal base, and an additional one before base of caudal; a small dark spot of size of pupil above lateral line at base of caudal.

W. H. L.

Two specimens, 105 and 111 mm. long, are included in the collection. These are brownish, with lower parts of head, chest, and abdomen pale, and lower half of opercle and chest nearly white; blue spots on rows of scales below lateral line now pale. The specimens have no definite black spots (not even the one on base of caudal mentioned in the specimen described by Dr. Longley), wherein they differ from those of *poeyi*.

The scales in advance of dorsal, unlike those of *poeyi*, are considerably reduced in size, there being seven or eight oblique rows next to mid-line of nape. Two canines in upper jaw anteriorly and 4 in lower jaw.

The following proportions and enumerations are based on the 2 specimens in the collection: Head (without opercular lobe) 3.7, 3.7; depth 4.05, 4.25. Eye in head 4.8, 4.8; snout 2.6, 2.7; interorbital 7.5, 7.5; caudal peduncle 2.0, 2.15; ventral 1.85, 2.0; pectoral 1.5, 1.5. D. IX, 11, IX, 11; A. III, 12, III, 12; P. 11, 12; scales 3-27-8, 3-26-7, before dorsal 7, 8.

West Indies to Florida.

S. F. H.

***Thalassoma bifasciatum* (Bloch)**

(Plate 26, figure 1)

Labrus bifasciatus Bloch, Naturgesch. ausland. Fische, vol. 5, 1791, p. 131—West Indies.

Julis nitida Günther, Cat. fish. Brit. Mus., vol. 4, 1862, p. 190—Jamaica.

Julis nitidissima Goode, Amer. Jour. Sci. and Arts, ser. 3, vol. 14, 1877, p. 293—Bermuda.

Bermudichthys subfurcatus Nichols, Proc. Biol. Soc. Washington, vol. 33, 1920, p. 62—Bermuda.

The forms here synonymized have been a source of much difficulty to ichthyologists. The first three names were perhaps for the first time regarded as equivalent in my report in *Carnegie Institution of Washington Year Book* Nos. 13 (1914, p. 208) and 14 (1915, p. 208).

The conclusion reached rests on observation of fish in the field. *Thalassoma nitidum* and *T. nitidissimum* there underwent changes in color in which from moment to moment under changing conditions either phase replaced the other. The two occurred together with every intermediate color phase connecting them. The scale counts were identical, and the difference in the form of the caudal was traceable through every intermediate stage in the elongation of the outer rays. Five years later, however, having in the meantime become aware that the *nitidum* form is often much larger than the smallest *bifasciatum*, in the series of reports mentioned I expressed doubt regarding the correctness of my earlier judgment. Later C. M. Breder (Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 60), after careful study of growth changes in material available to him, expressed the opinion that *nitidum* would eventually be synonymized with *bifasciatum*, but did not effect the reduction. Beebe and Tee-Van noted that 6 Haitian specimens

of *nitidum* were all female, and 16 of *bifasciatum* were all male, but still reserved final judgment regarding the relation of the two (Zoologica, vol. 10, 1928, p. 205).

Thirty additional specimens of *bifasciatum* collected in different years and at different places in the Tortugas now prove to be all males, but fish in the *nitidum* phase are not all females, as females and males in a lot of 115 number 85 and 30 respectively. The incomplete record of size range by sex and phase shows 50 *nitidum* females, 64 to 117 mm. long; 19 *nitidum* males, 84 to 114 mm. long; and 8 *bifasciatum* males, 114 to 146 mm. long. Clearly this is a single sexually dimorphic species, in which the male attains sexual maturity while still displaying that juvenile coloration which the female retains throughout life.

In early June the females seemed scarcely mature, though the young males were already producing sperm. By the first of August the breeding season appeared at its height. The eggs are transparent, of the pelagic type, 0.4 to 0.46 mm. in diameter, with a single oil globule varying in diameter from 0.088 to 0.096 mm.

In the *nitidum* stage or phase the body is obliteratively shaded, with dorsal fin dark, bordered by light blue, and covered by a dark spot to the 4th or 5th spine; lobes of caudal broadly dark-margined above and below; pectorals transparent except for slightly dusky tips; ventrals and anal almost transparent. The color is very variable. In the darker striped phase there is a median dark stripe from nape along base of dorsal, and a dark lateral band extending from snout through eye to caudal. The lateral stripe, however, may be replaced by six rectangular dark areas. When the light stripes separating the lateral and dorsal dark areas are yellow, one has the *nitidissimum* phase; when they are grayish, *nitidum*. Sometimes the dark stripes are so faint, the yellow so evident and widely spread, that the fish is almost completely yellow. The striped phase is usually shown by swimming, the banded one more frequently by resting fish, although bands are sometimes shown by the first and not always by the second. *Bermudichthys subfurcatus* Nichols (see citation above) is based on a fish in the banded phase.

The *bifasciatum* stage arises from the *nitidum* through change in color, and exertion of the angles of the caudal. The head and throat to the base of the pectorals become violet, the first two dark bars of the *nitidum* stage becoming almost black, the space between light blue, and that behind the second green or greenish. The intensification of the two black bars is perhaps the first indication of the impending change. The interspace between begins to assume its definitive hue while the bands on the trunk still persist. Rarely the pale bar fails to develop, and the body is then crossed by a solid black bar nearly as wide as the pectoral fin is long.

The adult fish in nature was not seen to change its color, but it is changeable in captivity. It is one of the many labrids that bury themselves in sand at dusk and rise when the morning sky is reddening. When routed out in a laboratory tank after dark, it had lost its black bars and was in a dress of simple blue. The changes in the *nitidum* stage, on the other hand, were readily observed in the field, as gray replaced yellow whenever the fish came from bottom covered with algae or living coral to gather about food placed on bare gray sand.

When fish in the juvenile pattern swim well up from the bottom they also put

off their yellow color. I have seen as many as 24 swimming together 4 or 5 feet above the gorgonian tops, some of which had continuous, some discontinuous stripes, but when they were induced to come down to bottom they put on their *nitidissimum* yellow. With them were fish in the full *bifasciatum* pattern and some intermediates.

The young were frequently seen pecking at other fishes, such as tangs, chubs, and sometimes pomacentrids, but most commonly at *Caranx ruber*. There is no obvious explanation of this behavior, unless they were relieving these fishes of ectoparasites. I did not, however, find such creatures in their stomachs. These young parasite-pickers, if their actions are correctly interpreted, may be seen in action daily at the same place, and continue this practice until the change to adult coloration occurs in the male.

Small crustaceans seem to provide the greater part of their food.

West Indies to Florida.

W. H. L.

Doratonotus megalepis Günther

Doratonotus megalepis Günther, Cat. fish. Brit. Mus., vol. 4, 1862, p. 125—St. Kitts.

Doratonotus decoris Evermann and Marsh, Rept. U. S. Fish Comm., pt. 25, 1899 (1900), p. 354—Ponce, Puerto Rico; Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 234, pl. 29.

Doratonotus boekei Metzelaar, Trop. atl. Vissch., 1919, p. 107, fig. 31—Curaçao; Bonaire.

There seems to be sexual dimorphism, and there surely is decided change in appearance with age. Hence the species has some names which must be placed in synonymy.

Specimens up to 70 mm. in length were seined rather frequently in the turtle grass. The species was not noticed elsewhere. In an aquarium it differed from other labrids in showing no inclination to bury itself in sand at night.

The young show rather clearly on a gray ground, suffused with green, a pattern of darker green longitudinal stripes, consisting of a supraocular and an ocular stripe, to which is added a little later another through the pectoral base, and all are clouded or blotched rather than of uniform color; pectorals and caudal colorless; other vertical fins largely of the color of body.

With growth three or four transverse brown bars develop beneath throat; the darker lines on body show a penciling of brown along their borders, particularly in the region of their earlier cloudiness, and brown begins to appear on the vertical fins.

The breeding season includes the greater part of June and at least all of July. Females only 37 mm. long with the abdomen greatly distended by their ovaries were seen. All females noticed were much smaller and duller in color than the males occurring with them. Having attained sexual maturity, females perhaps grow only a little larger, and change little in coloration. The males, however, grow considerably larger, and as they grow change much in appearance. Their green grows more vivid, and the original gray ground color becomes broken up into mere flecks spotting the green; the brown on the head becomes more rosy, on the body more diffuse, but still for a time forms irregular vertical bands or

blotches. On the dorsal and anal fins it takes the form of a network about green spots, and the caudal acquires many narrow bands of the same color.

Curaçao, Atlantic coast of Panama, West Indies, and Florida. W. H. L.

Xyrichthys Cuvier, 1815

Dr. Longley has brought together three species placed in two or even in three genera by some recent authors. The following key will show that the species are rather closely related and that they are properly placed in one genus. The anterior canines are virtually alike in all three species, there being 2 in the upper and 2 in the lower jaw. In all the species the depth of the body and the steepness of the anterior profile increase with age. Contrary to published statements, the anterior 2 spines of the dorsal are more or less produced in the young in all three local species.

S. F. H.

KEY TO THE SPECIES

- a.* Oblique rows of scales next to median line before dorsal 4, rarely 5; scales in the oblique series between lateral line and origin of dorsal 4 or 5; scales in the row immediately behind and under eye 6 or 7; mouth nearly horizontal; anterior profile very steep in adults; margin of snout and head narrowly compressed; no inky black spot on middle of side, at most with a dusky area *psittacus*
- aa.* Oblique rows of scales next to median line before dorsal 3; scales in the oblique series between lateral line and origin of dorsal 3; scales in the row immediately behind eye 3 or 4, rarely 5; a prominent inky black spot in a pale area (blue in life) present on side on 10th scale in 3d series below lateral line, at least in adult males
 - b.* Dorsal spines stiff, pungent; 1st soft ray of ventral greatly produced in adult males, often reaching opposite middle of base of anal; mouth nearly horizontal; snout rather pointed; profile steep in adults, as in *psittacus*; general color brownish, more or less blotched with light and dark areas or bars *ventralis*
 - bb.* Dorsal spines more or less flexible; 1st soft ray of ventral less produced in males, reaching at the most opposite base of 1st soft ray of anal; mouth notably oblique; snout more rounded; profile not as steep; general color much plainer, without dusky and paler blotches or bars *martinicensis*

Xyrichthys psittacus (Linnaeus). RAZOR FISH

(Plate 26, figure 2)

Coryphaena psittacus Linnaeus, Syst. nat., 12th ed., 1766, p. 448—Charleston, South Carolina.

Xyrichthys vermiculatus Poey, Memorias, vol. 2, 1860, p. 215—Cuba.

Xyrichthys jessiae Jordan, Proc. U. S. Nat. Mus., vol. 10, 1887, p. 698—off Tampa Bay, Florida.

Xyrichthys binghami Mowbray, Marine life, vol. 1, 1925, p. 1—Cay Sal Bank, Bahamas. Breder, Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 64, fig. 28.

In referring the monotypic genus *Xyrula* to synonymy under *Xyrichthys* it has been noted that its type species *Xyrula jessiae* is the same as *Xyrichthys psittacus*.

Its supposed diagnostic characters, generic and specific alike, are spurious. The superior border of snout and nape in the type owes its relative bluntness to dulling of the edge by digestion in the grouper's stomach from which it was taken. Erosion along this and other margins, because of their very thinness suffering greatest loss, apparently made the form more elongate and less compressed. The arrangement of scales below the eye is as in normal specimens of *X. psittacus*. Though most of the scales at the base of the fin have been lost, enough remain to show the line in its usual place, and not a row nearer base of dorsal as has been stated. Between the verticals of the 6th dorsal spine and the 7th ray there are not 8 scales in the lateral line, but between the 6th dorsal spine and the 5th soft ray are 9 lateral-line scales, precisely as in *X. psittacus*.

Its compressed body and knife-edged, almost cartilaginous snout and nape enable it to escape pursuit by darting beneath loose sand, and it occurs only over that kind of bottom. Once out of sight it is very difficult to find again, for it can move rather freely under the sand.

Not only is the species confined to a certain sort of bottom, but most of its members appear to have particular spots to which they return after their rather limited excursions afiel. This observation is confirmed by the fact that the same fish may repeatedly lead one to the same place. On the *Xyrichthys* ground north of Loggerhead Key as many as twenty selected spots, marked and protected, may be seen at once by a diver. On each, when the work is complete, stands a conical mound of coral fragments, which may measure as much as 14 or 15 inches in diameter at the base, rise to a height of 6 inches, and enclose a crater 3 or 4 inches in diameter, whose bottom is loose stirred sand.

Xyrichthys picks up and tosses its material into position, handling it in an orderly way, with determinate and serviceable results. If pieces from the rim of its building be toppled into the pit, they are removed and laid again in position. So it seems that such a shelter is heaped up with considerable expenditure of effort, is kept more or less in a state of repair, and is a semipermanent habitation, usually occupied, I think, by one fish only, which may often be seen resting beside or above it.

The adult male differs from the female in the steeper profile, and his ventral fins nearly or quite attain the anal origin, whereas hers fall a little short of the vent. The male is olive-buff dorsally, with a dusky area below the lateral line and beneath the 7th dorsal spine, lying in one of five bands rather distinctly defined when the fish rests, but shown faintly, if at all, when it swims; side of the head vertically streaked with blue on a ground of faint olive; two rows of scales at base of dorsal shimmering with pale blue, and every other scale on the side with a sharply drawn thin vertical line of blue at its base; median fins poppy red, darker toward outer or hinder margin; caudal with rather faint transverse wavering lines of blue; anal with stronger wavering lines of blue; iris blue with a ring of orange or yellow at the pupillary border.

In the female the dorsal ground color is vinaceous buff; the dorsolateral spot small and very faint; vertical blue lines on scales of sides diffuse and indistinct; pattern drawn more firmly on anal in female, in strokes cutting the rays sharply

and uniting distally in a regularly undulating submarginal line of blue; an irregular elongate patch of silver behind pectoral, and in part covered by it, following roughly the superior and posterior margin of the body cavity, often persisting for a very long time in alcohol.

A foot from the bottom is nearly as high as these fish are used to swimming, careening swiftly about at that level. Where they swim, their delicate coloring blends well with the pale tints of sand and water all around. The young display the same tendency as the adults to reproduce the shade of their surroundings, and a like tendency toward bandedness when resting and the plain phase when swimming, including a diffuse longitudinal stripe through eye and along lateral line. A small fish of 45 mm. was yellow, though they are usually browner. It had three faint blue lines on cheeks; dorsal slightly rosy; anal with indications of the blue pattern earlier mentioned; first dorsal rays scarcely elevated.

With increase in size the number of vertical stripes on the cheek increases, and the pattern is complicated by complete or partial splitting of those first appearing. At no stage in the development is there the least trace of the ventral banding that distinguishes the fish which Poey called *Xyrichthys venustus*, and which Cuvier and Valenciennes named *Xyrichthys lineatus*.

Several stomachs examined contained crabs and fragments of mollusk shells.

West Indies to Florida and sometimes northward at least as far as North Carolina.
W. H. L.

Xyrichthys ventralis Bean

Xyrichthys ventralis Bean, Bull. U. S. Fish Comm., vol. 8, 1888 (1890), p. 198, pl. 29, fig. 1—Cozumel Island, Yucatan.

Cryptotomus retractus B. A. Bean (not of Poey), The Bahama Islands, Baltimore Geog. Soc., 1905, p. 317—Eleuthera and Clarence harbor, Bahamas.

Xyrichthys argentimaculatus Breder (not of Steindachner), Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 66—Cay Sal Bank, Bahamas; Alligator Reef, Florida.

Novaculichthys rosipes Breder (part, nos. 270–273, not of Jordan and Gilbert), Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 67—Bahamas.

Xyrichthys venustus Parr (not of Poey), Bull. Bingham Oceanog. Coll., vol. 3, art. 4, 1930, p. 93—Turks Island, Bahamas.

Xyrichthys splendens Parr (not of Castelnau), *ibid.*, p. 95—Bahamas. Beebe and Tee-Van, Zoologica, vol. 13, 1932, p. 120—Bermuda.

The young were caught from time to time on sandy patches in turtle grass. These are fish of sandy bottom and open water. They bury themselves at night. If followed closely, they may go repeatedly to the same spot and hide by darting head foremost out of sight under sand, but unlike *Xyrichthys psittacus*, they heap up no rubble.

In color pattern and shade they are very changeable. Pale streaks on the head separate narrow bars of ground color; trunk with brown lines in two diagonal series defining pale spots on scales; five broad and irregular bands sometimes shown, the first at nape and under dorsal origin, the last at base of caudal, those under bases of dorsal and anal extending on these fins. In a more sharply banded phase these are divided unequally, being alternately narrow and broad, and more

numerous; pectorals transparent; ventrals mottled brown like the body; dorsal darker to 2d spine; caudal crossed at base by a curved bar, foreshadowed by a dorsal and ventral dark spot.

At a length of 40 mm. the first 2 dorsal spines are flexible, about twice the height of the pungent 3d, from which the others are graduated upward. The membrane is deeply emarginate before the 3d spine. The lobe of the fin so set off is darker than the rest of the fin and has a small spot darker still above and behind the base of the 1st support.

I have had specimens up to 70 mm. in length in which the first 2 supports remained higher than the others. Fish of such size swim often in sidling tilted poses, with anterior lobe up and caudal spread wide. Several swimming among *Thalassia* were nearly uniform olive or yellow-green, and banded green. Others were marked with gray and maroon, repeating faithfully the colors of the frayed *Zonaria* among which they moved. When pressed closely these small fish hide by plunging head foremost into sand like their elders.

With a proper series available it is plain, as Parr has shown, that as they grow the anterior lobe of the dorsal stands up relatively less and less conspicuously above the remainder of the fin, until it is merged almost indistinguishably with it. At the same time the color pattern becomes more elaborate and the color of the body richer in hue. Sexual dimorphism in color and structure makes its appearance in specimens of larger size.

Where sand and grass meet to the west of Southwest Key, a diver may find the young with their upstanding dorsal lobes, the adolescent showing the approach of sexual maturity in their dimorphism, and the fully mature all together. The same range of growth stages may be found also on sandy bottom to the north of Loggerhead Key, where the largest individuals occurred most commonly.

In a living male of 130 mm. the body was bluish gray, or in some lights green or greenish gray; scales on side bordered with faint olive about bluish centers; side of head between snout and opercular margin with seven brassy lines narrower than the bluish interspaces, the one below eye forked ventrally; dorsal fin very narrowly blue-margined, colored like the body anteriorly at base, more and more widely rosy posteriorly, the color spreading inward from the blue border, the rosy ground marbled with about twenty irregular blue streaks; anal essentially the same, except that blue rather than rose is dominant; pectorals rosy toward tip; ventrals bluish; basal four-fifths of caudal irregularly parted in four olivaceous bands by wavering lines of blue, the terminal fifth rosy with a pale and narrow blue margin; iris carmine.

The *third*¹ scale down and back from the tenth in lateral line in the male has

¹ In the type of *Xyrichtys splendens* Castelnau (a male 146 mm. long), a corresponding spot falls on the *second* scale below and behind the eleventh in lateral line, as it does in 1 of 2 specimens in the U. S. National Museum (no. 43293). This too is a male, 141 mm. long, with a minor spot on the next scale lower in the eleventh on the one side and the second lower in the eleventh on the other. Five others in Vienna, and all of 6 from Bahia, have a black spot in the second row below lateral line. This difference, with the faded color patterns of preserved material, will serve to distinguish the two species. Of the Brazilian form I have found no authentic record in the West Indies or Caribbean.

a black spot narrowly margined with blue, little variable in size, less variable in position, and only rarely absent on one side in the many specimens examined. I observed it first in fish 95 mm. long, though it may appear in some a little smaller. In large fish it lies in the posterior third of a rosy patch about 5 scales long and 3 deep. Another secondary sexual character of the male is the long ventral fin, of which the tip may extend to base of 4th anal ray.

The male and female are both variable in shade, as well as in pattern. They may swim in self-color (apart from the male's distinctive spot), or rest in bands of two-toned bluish green, with the black spot falling in one of the bands.

W. H. L.

This seems to be a smaller fish than the other local species, as a specimen only 110 mm. long is a mature male with high anterior profile and greatly produced ventral ray. Specimens of similar size of the other species evidently are still immature.

West Indies to Florida.

S. F. H.

***Xyrichthys martinicensis* Cuvier and Valenciennes**

Xyrichthys martinicensis Cuvier and Valenciennes, Hist. nat. poiss., vol. 14, 1839, p. 49—Martinique.

?*Xyrichthys lineatus* Cuvier and Valenciennes (not of Gmelin), *ibid.*, p. 50.

Xyrichthys modestus Poey, Repertorio, vol. 2, 1867, p. 238—Cuba.

?*Xyrichthys venustus* Poey, Enumeratio, 1875, p. 110—Cuba.

?*Xyrichthys rosipes* Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 7, 1884 (1885), p. 27—Key West, Florida.

Xyrichthys infirmus Bean, Bull. U. S. Fish Comm., vol. 8, 1888 (1890), p. 199, pl. 29, fig. 2—Cozumel Island, Yucatan.

W. H. L.

The synonymy given was prepared by Dr. Longley, though it presumably is not as complete as he intended to make it, as is shown by marginal notes. The following discussion (condensed) concerning synonymy was found among his unfinished manuscripts. It may not be as complete as he would have made it, yet it seems worthy of inclusion, as it is based on specimens, including some types, examined in museums in America and Europe.

As the tips of the ventral fins in Poey's *Xyrichthys modestus* reached at least the base of the 3d anal spine, the possibility that it is the female of *X. psittacus* is excluded; the females of every known West Atlantic species of *Xyrichthys* are excluded by the same character. With equal certainty the red iris alone excludes either sex of *X. psittacus*. The simple pattern of vertical lines on the head is an additional similarity, and reference to the occasional occurrence of a dark area on the middle of the side of the trunk, and to a pinkish axillary stripe, makes the identity of the fish as certain as may be without access to the type.

Before Poey named his *X. modestus*, Valenciennes had the same or another from Martinique. The types are 125 and 145 mm. long. Their colors have faded, but a trace of the original pattern can still be seen. The basal two-thirds of the caudal has three diffuse bands, separated and bounded by four pale hair lines.

Between 9 others from Martinique, and a specimen 116 mm. long from Cuba, I find no difference.

The types of *X. martinicensis*, as well as some of the other specimens, are females, and none are demonstrably males. The ventrals reach only to the anus. In one specimen, standard length 116 mm., the head is 33 mm. long, the depth 31 mm.

What Jordan and Evermann called *Novaculichthys infirmus* (Bull. U. S. Nat. Mus., No. 47, pt. 2, 1898, p. 1616), and believed distinguishable from *X. martinicensis* by the dusky axil and scales on the cheeks, cannot be distinguished by either. The West Indian specimens mentioned all have dusky axils, and the few reduced scales on the cheek are as well developed as in *infirmus*. I think, therefore, that the specimens from Martinique must be accepted as types of the species, which is now known not only from Martinique, but from Bermuda, the Bahamas, Florida, Cuba, Yucatan, and the Dutch West Indies.

In the *Proceedings of the U. S. National Museum* (vol. 9, 1886, p. 541) there is a note by Jordan on Cuvier and Valenciennes' type of *X. vitta*; since that time it has generally been rated a synonym of *X. martinicensis*. In the register of the Musée d'Histoire Naturelle this type is now entered as *Novacula cultrata*, which records a judgment tending to remove the name *vitta* to the synonymy of another species. I have made no adequate effort to determine the correctness of this assignment of this specimen of unknown origin. It is, however, clearly not *X. martinicensis*, and it may not be distinct from *X. psittacus*.

The types of *X. rosipes* Jordan and Gilbert are even smaller than the original description indicated, the larger one, an alleged male, being 43 mm. long, and a putative female 32 mm. long. That the sex of either was determined, or even determinable, is not evident.

The following notes (condensed) appear in Dr. Longley's papers under *Novaculichthys rosipes*, a name transferred to the synonymy of this species: Young fish whether swimming or at rest erect the dorsal fin with its 2 anterior elongated spines, whereas adults carry it depressed. Both young and adults bury themselves in the sand when closely pursued. One, when followed, twice returned and buried itself in the same place, indicating that they may have particular places for hiding.

Adults generally are common on sandy bottom of gravelly texture. The young were seen on the sandy bottoms of some of the larger holes in the reef and sometimes in sandy holes in turtle grass or about coral heads.

Ventrals in a large specimen reaching base of 3d anal spine, rosy in color; pectorals rosy at tip; scales with anterior half blue, posterior green; an inky black blotch with a very narrow pale blue margin on side covering posterior half of 10th scale in third row below lateral line, and situated in posterior third of a large rosy patch, 5 scales long and 3 deep; five vertical brassy bars on the blue snout and cheek (middle one branching ventrally), and three on opercle; dorsal reddish toward margin, marbled with blue toward base, the lines of blue being more oblique and regular posteriorly; caudal broadly margined with red or rose, the remainder being crossed by four broad brassy yellow bands separated by pale

blue; anal narrowly pale-margined and with two red lines parallel with the border, separated by pale blue, proximal three-fourths of fin marbled blue and red; iris golden, surrounded by maroon. A smaller specimen lacked the black spot on the side, was less brilliantly colored in general, and tended toward olivaceous.

A small specimen, 50 mm. long, had bands on cheek; a series of dark spots from eye to base of caudal, collectively forming a line; and some evidence of five narrow dark bands on body.

Very changeable in coloration. The adults are plainer in pattern and paler in color when swimming than at rest, when they are banded; ground color of a two-toned bluish green, with a dark spot in one of the bands. Young fish swimming in turtle grass were rather uniformly pale olive or yellow-green; and when pecking at grass they became banded green.

West Indies to Florida.

S. F. H.

Family SCARIDAE. PARROT FISHES

Cryptotomus Cope

Cryptotomus Cope, Trans. Amer. Philos. Soc., vol. 14, 1871, p. 462 (*C. roseus* Cope).

Nicholsina Fowler, Copeia, No. 14, 1915, p. 3 (*Cryptotomus beryllinus* Jordan and Swain = *Callyodon auropunctatus* Cuvier and Valenciennes).

This genus is closely related to *Sparisoma*. As Breder (Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 69) pointed out, however, it is not permissible to state, with Jordan and Evermann (Bull. U. S. Nat. Mus., No. 47, pt. 2, 1898, p. 1621), that the gill membranes are broadly joined to the isthmus, "not forming a fold across it." The fold in the several species is slight but evident. Besides the difference in dentition, the intestine, though having the same number of loops in *Cryptotomus auropunctatus* and *Sparisoma radians*, for example, has in the former an even contour without such sacculation as characterizes *Sparisoma* and *Scarus*. With this difference in structure is apparently associated a difference in feeding habits, since the alimentary tract of *Cryptotomus* usually is filled almost exclusively with vegetable debris, triturated sand not forming as large a part of the content as in *Sparisoma* and *Scarus*.

W. H. L.

Cryptotomus roseus Cope

Cryptotomus roseus Cope, Trans. Amer. Philos. Soc., vol. 14, 1871, p. 462—St.-Martin, West Indies.

Cryptotomus crassiceps Bean, Proc. Biol. Soc. Washington, vol. 19, 1906, p. 32—Coopers Island, Bermuda; Field Columbian Mus., Zool. Ser., vol. 7, 1906, p. 70, fig. 9.

Cryptotomus beryllinus Metzelaar (not of Jordan and Swain), Trop. atl. Vissch., 1919, p. 110. Breder, Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 67—Florida; Bahamas. Parr, Bull. Bingham Oceanog. Coll., vol. 3, art. 4, 1930, p. 107—Bahamas.

Most of the specimens obtained were taken in the 10-fathom channel east of Loggerhead bank.

The breeding season at Tortugas continues at least from June to August in-

clusive. Sexual maturity is attained early; a female 63 mm. long contained ripe eggs. Her first projecting lateral canines had not appeared, nor did others show any at 65 and 70 mm., though one from St. Vincent at 70 mm. already has 2 on either side, and a slightly smaller one has 2 and 1 respectively. No males as small as these, and known to be mature, have been secured, but one of 82 mm. has 2 pairs, and one 107 mm. long has 4 on one side and 1 on the other.

I do not know at what least length the male coloration is developed. Adults are bluish gray above, more green on head, and bluish white below; a red stripe extending from upper margin of opercular cleft almost to base of caudal, set off by light lines above and below, and spotted with the ground color; a narrow red line from before eye to angle of mouth, and a second paralleling it behind; iris red; half a dozen red spots below and behind eye; an orange-red dash or dashes across base of pectoral, and a blue spot at base of its upper rays; lower lip blue.

Females are red, and more or less mottled with brown. They have the power to assume a pattern of stripes as well as a blotched pattern.

Brazil to Florida and Bermuda.

W. H. L.

***Cryptotomus auropunctatus* (Cuvier and Valenciennes)**

Callyodon auropunctatus Cuvier and Valenciennes, Hist. nat. poiss., vol. 14, 1839, p. 290—Santo Domingo.

Cryptotomus ustus Jordan and Evermann (part not of Cuvier and Valenciennes), Bull. U. S. Nat. Mus., No. 47, pt. 2, 1898, p. 1624.

Cryptotomus beryllinus Jordan and Swain, Proc. U. S. Nat. Mus., vol. 7, 1884, p. 101—Havana; Key West, Florida.

The larger of 2 type specimens is still in Paris in good condition. It is 175 mm. in length, its depth at dorsal origin 43 mm.; head 48 mm., diameter of orbit 8.0 mm., interorbital width 10.0 mm.; snout 19.0 mm. On the left side of upper jaw it has 1 slight recurved canine, with the site of another indicated; right side with 1 and the base of another; curvature of dorsal and ventral contours of head almost the same. I have seen other specimens from Haiti, Alligator Reef, and Key West (types of *C. beryllinus*), as well as many of all sizes from Tortugas, and still others from Trinidad and Colon. Jordan and Evermann reported what may be considered the same species from Charleston and Pensacola. This is a northern form allied to *Cryptotomus ustus*, but distinct from it.

Cryptotomus ustus (Cuvier and Valenciennes) attains at least the length of 260 mm. It is sexually dimorphic. By color pattern alone males of 187 mm., and perhaps considerably less, are readily distinguishable from other American species. Even in material long in alcohol, traces of a lilac line from eye to upper jaw just behind lateral canines and four or five irregular rows of dark spots crossing caudal fin betray them. The size and proportions of the largest are also distinctive. In the Museum of Comparative Zoölogy are 5 large males, and in the British Museum another, all from Brazil. Cuvier and Valenciennes described this sex very well, but their plate appears to show the female.

Cryptotomus auropunctatus, too, is sexually dimorphic in coloration. The adult

male has a narrow blue line bordered behind by red, running from eye to mouth in advance of its angle. None has been seen, however, in which there is any suggestion of the dark caudal spots of *C. ustus*. Projecting lateral canines appear in *auropunctatus* sometimes at least in fish not more than 140 mm. long, whereas the record shows specimens of *C. ustus* of 154, 157, 158, 165, and 171 mm. with none, and others of 168, 172, and 173 mm. with none, or with 1 or 2 on the side. This northern species, as represented at Tortugas, seems scarcely to exceed 160 mm. in length.

Green specimens were seined on the grass flats about Long Key and inside Bird Key reef, and red ones trawled in 10-fathom channels, illustrating the common tendency of fish of the same kind to be, within limits, more ruddy in deeper water. Both extremes of color are quickly replaced by browns and grays in the somber surroundings of the laboratory aquarium. It is sometimes nearly monochrome, except for its countershading, sometimes very strongly marked with stripes (median, ocular, and pectoral), and sometimes mottled. All is fluid, and changes take place according to the fish's activity and change in the hue of its surroundings.

Sometimes, but not regularly, *C. auropunctatus* buries itself in sand at night. Panama, West Indies, to Florida; sometimes straying northward. W. H. L.

Sparisoma Swainson, 1839

Dr. Longley examined many specimens in American and European museums. Some of his accounts of the species of this genus he obviously had not finished, as is shown by marginal notes. Several such notes concerned synonymy. As I do not feel competent to complete them without making extensive studies of specimens and the literature, for which neither the time nor facilities are at my disposal, I have let the synonymy stand as prepared by him, except for the elimination of a few names which he himself had questioned, and which according to my own studies cannot at this time be considered synonyms.

Dr. Longley has a note on the examination of the type of *Sparisoma strigatus* (Günther, Cat. fish. Brit. Mus., vol. 4, 1862, p. 212), type locality unknown. This species has been assigned, apparently erroneously, to the American fauna. In addition to the type, from an unknown locality, Dr. Longley saw 4 specimens in the British Museum, all from St. Helena. S. F. H.

Sparisoma abildgaardi (Bloch). RED PARROT FISH

(Plate 27, figures 1, 2; plate 28, figure 1)

Sparus abildgaardi Bloch, Naturgesch. ausland. Fische, vol. 5, 1791, p. 22, pl. 259—America.

Scarus coccineus Bloch and Schneider, Syst. ichth., 1801, p. 289—Cuba (after Parra).

Sparus aureo-ruber Lacépède, Hist. nat. poiss., vol. 4, 1803, pp. 56, 163—Martinique (on drawing by Plumier).

Scarus amplus Ranzani, Nov. com. Acad. sci. inst. Bonon., vol. 5, 1842, p. 324, pl. 25—Brazil.

The red parrot fish, so called, is highly variable in coloration. It is sometimes brown, changing gradually to red below, with the head, particularly above,

washed with yellow. Sixteen white spots appear on the side, each covering a single scale, and a creamy band crosses base of caudal. This spotted phase is commonly displayed when the fish is among corals and gorgonians or over bottom covered with brown algae. In a lighter phase the yellow and red are suppressed, but the spots remain. There are also unspotted phases, dark and light, in the first of which in particular the margins of the scales are darker; and finally there is a blotched phase.

These fish nip algae from dead coral, and on gravel bottom take bits of the weedy "stone" in their mouths and mumble it over. One may see them drop many of these, though some of the smaller ones are perhaps milled by the pharyngeal teeth.

The projecting posterior canines in this species from a comparatively small size are normally 1 pair, but a specimen 165 mm. in length in the Museum of Comparative Zoölogy has 2 scars on each side before its standing canines.

W. H. L.

Dr. Longley has said nothing about the relative abundance of this species in his probably incomplete account. It may be assumed, however, that it is common, as at least twenty different observations are mentioned in his notes.

Atlantic coast of tropical America, northward to Florida.

S. F. H.

Sparisoma distinctum (Poey)

Scarus distinctus Poey, Memorias, vol. 2, 1861, p. 423—Havana.

Scarus frondosus Günther (not of Cuvier), Cat. fish. Brit. Mus., vol. 4, 1862, p. 210.

Scarus erythryinoides Guichenot, Mem. Soc. sci. nat. Cherbourg, vol. 11, 1865, p. 10—Santo Domingo.

Scarus oxybrachius Poey, Repertorio, vol. 2, 1868, p. 342—Havana.

Sparisoma emarginatum Metzelaar (not of Poey), Bijdr. Dierk. Amsterdam, vol. 22, 1922, p. 138—Curaçao.

Scarus frondosus Günther, being checked, proves to be *Sparisoma distinctum*. Guichenot's type of *Scarus erythryinoides* is the same, rather than *abildgaardi*, for which it has passed. The type of *Scarus oxybrachius*, in the Museum of Comparative Zoölogy, is *distinctum*.

Poey sent to the Museum of Comparative Zoölogy 5 specimens of *S. abildgaardi*, correctly named. He sent also 9 specimens of *S. distinctum*, 4 of which at least were so labeled. Another came under the manuscript name *Scarus festivus*, which he did not later take up. Poey's statement that *Scarus oxybrachius* and *S. distinctus* closely resembled each other (and not *Sparisoma abildgaardi*) suggests the identity of these species. In proportional measurements *S. abildgaardi* at 210 mm., the length of the type of *oxybrachius*, does not match that species as closely as *S. distinctum* of 220 mm., the discrepancy appearing particularly in the proportion of eye to head, to snout, and to distance from eye to angle of mouth, all reflecting the eye's smaller size in *abildgaardi*. The lateral canines of *S. abildgaardi* at 210 mm. are stronger than those of *distinctum* at 220 mm., so the close relation between the latter and *oxybrachius* is supported by direct comparison of

species concerned. The interpretation of the evidence makes the type of *oxybrachius* what *oxybrachius* promised to be, a synonym of *distinctum*.

This fish is often common in its striped phase. It has in life a bluish-green rather than a brownish cast, which, with the very white spot at the end of base of dorsal, distinguishes it at once from other species of its own size.

Reported by Jordan and Evermann (Bull. U. S. Nat. Mus., No. 47, pt. 2, 1898, p. 1635) southward to Bahia, but on what authority is uncertain. Metzelaar's specimens from Curaçao are the southernmost ones known to me, ranging thence to the West Indies and Florida.

W. H. L.

Sparisoma radians (Cuvier and Valenciennes)

Scarus radians Cuvier and Valenciennes, Hist. nat. poiss., vol. 14, 1839, p. 206—Brazil.

Scarus lacrimosus Poey, Memorias, vol. 2, 1861, p. 422—Cuba.

?*Scarus atomarius* Poey, Memorias, vol. 2, 1861, p. 423—Havana.

Scarus hoplomystax Cope, Trans. Amer. Philos. Soc., vol. 14, 1871, p. 462—St.-Martin, West Indies.

Sparisoma xystrodon Jordan and Swain, Proc. U. S. Nat. Mus., vol. 7, 1884, p. 99—Key West, Florida.

Sparisoma niphobles Jordan and Bollman, Proc. U. S. Nat. Mus., vol. 11, 1888, p. 551—Green Turtle Cay, Bahamas.

Sparisoma flavescens Metzelaar (part not of Bloch and Schneider), Trop. atl. Vissch., 1919, p. 114.

Sparisoma radians Meek and Hildebrand, Field Mus. Nat. Hist., Zool. Ser., vol. 15, pt. 3, 1928, p. 750, pl. 73, figs. 1, 2.

As the abbreviated synonymy above suggests, this species has been much misunderstood. Its power of great change in color and pattern and its sexual dimorphism, as Meek and Hildebrand (see reference above) were first to point out, make the recognition of its boundaries difficult.

At Tortugas it abounds, and is found chiefly on or near the grass flats.

The males are well marked by their dark-margined caudal fin, and by a narrow blue line with a red one of the same width close behind it, both running from eye to angle of mouth. A light blue opercular margin, with similar blue on pectoral base, marks the females, on the sides of which during the breeding season at least an ill-defined reddish area behind the pectoral brightens their hues. There is a minor difference in the transient phases of the sexes, as well as in their relatively permanent markings. Both frequently show a median dorsal and an ocular dark stripe. In the female a pectoral stripe of this pattern may be seen too, certainly more commonly than in the males.

This fish also has a mottled phase. Fish which had become relatively quiet under cover, without actually resting on the bottom, showed four dark dorsal patches. A few scales darker than the others marked the location of these patches sometimes when the fish was in motion, although at other times they disappeared entirely. It changed almost immediately from gray to green when it passed from sand into *Thalassia* planted over part of the bottom of an aquarium. Resting on the bottom under the grass it was almost of a clear rich green, with a few inconspicuous mottlings of gray on the dorsal fin and at the level of the light line separating the median and ocular stripes in the striped phase.

This species shows well how the lateral canines develop. The first to appear is the eventual posterior series. In the male it is present in fish of 50 mm. or less in length. It is supplemented by the next in order in the same oblique series and dropped several times before the first of the anterolateral canines appear, at the approximate length of 80 mm. The female lags a little both in time and in extent of dental development. The largest fish may show on the face of the upper jaw as many as 4 scars besides standing teeth in the posterior series, but usually 1 only before the anterolateral series.

The type of *Sparisoma niphobles*, in my judgment, is a female of this species. The type of *Scarus atomarius* is lost. It is the only specimen of *Sparisoma* of which I am aware which shows the dentition of *S. radians* without belonging to that species. Its identity may be established for every practical purpose by considering these facts: *S. radians* is very common at Tortugas, also in Puerto Rico (Evermann and Marsh, Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 236), and Panama (Meek and Hildebrand, see reference above); that is, in every direction from Cuba. Poey (Memorias, vol. 2, 1861, p. 422) knew the male of *radians* as *Scarus lacrimosus*. He did not speak of it as a rare fish. Nor did he speak of *S. atomarius* as rare; and this is the only scarid he listed among his many which could possibly be the missing female of *radians*. The description of its color coincides in some notable respects with that of *radians*.

The female is mature at a length of 70 mm. or less, and is ripe in July and August. The eggs are transparent and pelagic.

In his discussion of *Sparisoma flavescens*, Metzelaar (see citation above) mentioned young fish with lateral canines, which he believed they would lose before attaining maturity. This, however, is an unwarranted expectation. His small fish are specimens of *S. radians*, the only known species of the genus which at the size he mentions (85 mm.) develops projecting lateral canines.

It may be noted that, although the absence of canines in the young of species later to have them often makes their identification difficult, differences in dentition once developed are among the most distinctive appearing in this genus.

W. H. L.

A field note, probably made after the foregoing was written, was found in which Dr. Longley stated that a small fish, 68 mm. long, taken in 10 fathoms of water was "as red as the *Cryptotomus* coming from the same depths."

This fish, as indicated, is sexually mature at a small size, and accordingly it does not seem to grow large. The largest specimen in the Tortugas collection is only 106 mm. long, though Meek and Hildebrand (see reference above) reported one from Panama 140 mm. long.

In preserved material the male is readily separated from the female (sexes determined by the dissection of more than 50 specimens from Tortugas and Panama) by the presence of a black band extending entirely across the base of the pectoral in the male, which the female does not have.

Atlantic coast of tropical America, northward to Florida and the Bahamas.

S. F. H.

Sparisoma aurofrenatum (Cuvier and Valenciennes)

This fish is not common at Tortugas.

It was seen in three color phases, plain, striped, and mottled. The first term is not strictly accurate, for this pattern includes several permanent marks in contrastive color, namely a scarlet bridle, red and yellow opercular spot, dark post-humeral spot, and black-tipped caudal lobes. This is the phase commonly shown by the swimming fish, though it may swim, too, in stripes. It changes to stripes when coming half to rest in the pecking motions of feeding. I have observed the mottled phase only in a fish which had come quite to rest.

West Indies to Florida.

W. H. L.

Sparisoma viride (Bonnaterre)

Scarus viridis Bonnaterre, Tab. encyc., Ichth., vol. 6, 1788, p. 96—Bahamas (after Catesby).

Scarus catesby Lacépède, Hist. nat. poiss., vol. 4, 1803, p. 16 (after Catesby).

Scarus catesbaei Cuvier and Valenciennes, Hist. nat. poiss., vol. 14, 1839, p. 183. Günther, Cat. fish. Brit. Mus., vol. 4, 1862, p. 210.

Callyodon psittacus Gronow (not of Linnaeus), Cat. fishes (ed. Gray), 1854, p. 84.

Scarus melanotis Bleeker, Versl. Akad. Amsterdam, vol. 14, 1862, p. 126—St. Croix.

Rather common in the coral-gorgonian belt, usually feeding, but going occasionally into the coral stacks and remaining for an indefinite period. It sometimes serves as host to young *Echeneis naucrates*, whose presence irritates it.

In coloration this species is decidedly changeable. It appears most commonly on the reef in a brownish phase, with red lines on the head, a yellow spot on the tip of the opercle, and an orange one on the base of the caudal. From under coral heads it comes out duskier. It has a spotted phase like that of *Sparisoma abildgaardi*, in which it is not infrequently seen. Individuals may also be seen sometimes at night, resting beside or on corals, in a blotched pattern.

West Indies to Florida.

W. H. L.

Sparisoma spinidens (Guichenot)

Scarus spinidens Guichenot, Mem. Soc. sci. nat. Cherbourg, vol. 11, 1865, p. 15—Bahia.

Sparisoma rhomaleum Meek and Hildebrand, Field Mus. Nat. Hist., Zool. Ser., vol. 15, pt. 3, 1928, p. 754, pl. 74, fig. 1—Colon, Panama.

Sparisoma spinidens Longley, Carnegie Inst. Wash. Year Book No. 32, 1933, p. 294.

The type (in Paris) is 460 mm. long, head 113 mm., eye 20 mm., interorbital width 22 mm., depth at dorsal origin 130 mm., length of pectoral 77 mm. The head is characteristically rounded, the caudal lobes greatly elongated, the upper slightly more, the exerted part equaling the remainder. Nothing remains of the natural color, but diagnostic details are still visible. The pectoral is opaque, except for its pale posterior border as broad as eye; a dark saddle-shaped blotch on upper part of pectoral base, extending down both before and behind into axil; caudal dusky except for a lighter crescent, originally pink, mesially wider than pupil, at posterior margin. Several rather weak teeth, interlocking at symphysis of upper jaw, 3 on one side, 2 on the other; seven rows on right side, and five on left, with projecting canines, often 3 to the row, erupting, standing, broken, or

represented by scars. Counting standing teeth only, and including those at the symphysis, there are 9 on the right and 11 on the left side.

The species is poorly represented in collections and is little known. By Jordan, Evermann, and Clark (Check list, 1930, p. 432) it is doubtfully referred to the synonymy of *Sparisoma chrysopteron*, its specific resemblance to which is largely confined to the possession of more projecting canines than other parrot fishes have. The British Museum has a specimen from Tobago; the U. S. National Museum, one from Dominica and another from the "West Indies." In the Museum of Comparative Zoölogy are 2 specimens sent by Poey from Havana under the manuscript name *Scarus brachyvarius* and described by him without name, as his no. 735, in the *Enumeratio* (1875, p. 113).

This is one of the less common parrot fishes, though it was seen not rarely on the reef on a calm day from a launch moving slowly. Its swimming phase is faded green, but as often as it descends to the bottom and rests, it assumes a mottled pattern of brown and verdigris, with bands showing under its chin. On rising to swim, it resumes its previous coloring.

Panama, and West Indies to Florida.

W. H. L.

Sparisoma chrysopteron (Bloch and Schneider)

Scarus chrysopterus Bloch and Schneider, Syst. ichth., 1801, p. 286, pl. 57—American seas.

Scarus lateralis Poey, Memorias, vol. 2, 1860, p. 219—Cuba.

Scarus brachialis Poey, *ibid.*, 1861, p. 345—Cuba.

Scarus maschalespilos Bleeker (part), Versl. Akad. Amsterdam, vol. 14, 1862, p. 127—Surinam.

Sparisoma lorito Jordan and Swain, Proc. U. S. Nat. Mus., vol. 7, 1884, p. 95—Havana.

Sparisoma elongatum Meek and Hildebrand, Field Mus. Nat. Hist., Zool. Ser., vol. 15, pt. 3, 1928, p. 757, pl. 74, fig. 2—Panama City?, Panama.

Sparisoma brachiale, *S. lorito*, and *S. chrysopteron* are names given growth stages of one species. The types of *Scarus maschalespilos* (in Leiden) are 2 small fish, 217 and 244 mm. in total length and not, I think, of the same species. I take the larger one to be young *chrysopteron*, and the other appears to be a young *flavescens*.

The type of *S. brachiale* (Mus. Comp. Zool. no. 14555) is a specimen 225 mm. long. It has 2 small lateral canines on either side. In the same collection is another of Poey's specimens, which at the length of 200 mm. lacks these projecting teeth.

The type of *S. lorito* (U. S. Nat. Mus. no. 35082), which is 260 mm. long, has 3 canines on the right side and 1 on the left.

Of *Scarus lateralis*, long recognized as a synonym of *Sparisoma chrysopteron*, specimens sent by Poey to the Museum of Comparative Zoölogy range in length from about 290 to 375 mm. The largest has 5 canines on one side and 3 on the other, with 8 scars on the one and 9 on the other side, where canine teeth have stood.

Preserved specimens, too small to have developed canines and exerted caudal lobes, are sometimes separable with difficulty from *S. pachycephalum*, but the trimness of form, resulting from a slight compression of the head and the smoothness of the curve from dorsal origin to tip of snout of *S. chrysopteron*, helps to

distinguish this species from the other. When it once appears, a narrow dark border at the posterior margin of the caudal fin marks it also.

Sparisoma elongatum is known from the type only, a specimen 230 mm. long, obtained in the market at Panama City. Meek and Hildebrand, who described it (see citation above), were alive to the possibility that it might have been shipped across the isthmus, but from their knowledge of movements of fish in the ordinary course of trade they considered that unlikely. The type specimen seems to have suffered from its treatment. In form, however, it is very like *S. chrysopterum*. It has no protruding lateral canines, which is not surprising, for these teeth appear first roughly only at the size it has attained. I note, nevertheless, a pit from which such a tooth should shortly have grown. The rather small, sharply defined dark spot at base of upper pectoral rays is like that in *S. chrysopterum*, and the lunate caudal fin, with light center and dark margin above and below, is bordered behind by a very definite thin, dark line, such as *chrysopterum* has. I am compelled, therefore, to believe that this is a transported specimen of *S. chrysopterum*, and that both genus and species are confined to the Atlantic.

This is among the less common of the parrot fishes at Tortugas, though scarcely rare. Specimens were found near coral heads, near water deeper than that over the reefs in general. It was taken also at 10 fathoms.

It is highly changeable in coloration. While swimming it is usually bluish, with dorsal fin and central caudal rosy, and the black spot on pectoral base showing conspicuously on the plain ground; white spots may not be quite obsolete. Resting, as in an aquarium tank, it shows a mottled pattern, largely in browns.

W. H. L.

Dr. Longley has pointed out that preserved specimens sometimes are hard to distinguish from *S. flavescens* before the canine teeth are developed. I have found no specimens in the collection, which all reached me without labels, that I can positively identify as *S. chrysopterum*, as none has canine teeth, including the largest one, 285 mm. long. On the other hand, the type of *S. lorito*, a species referred to the synonymy of *S. chrysopterum* by Dr. Longley, which is only 238 mm. long, has 1 canine on one side and 3 on the other. Therefore, if the Tortugas specimens are of the same species it must be assumed that canines are developed at a much smaller size in some individuals than in others.

I have compared the Tortugas specimens also with a specimen from Colon, Panama, identified as *S. squalidum* by Meek and Hildebrand, to which Dr. Longley has made reference in his discussion of *S. pachycephalum* (see p. 215). Although Dr. Longley did not say specifically that he considered this specimen the true *S. flavescens*, he did imply it, and he indicated in his copy of Jordan, Evermann, and Clark's *Check list* that he considered *S. squalidum* a synonym of *S. flavescens*. He did not, however, list this species from Tortugas in his manuscript. I am unable to detect any differences between the Colon specimen and these Tortugas fish. Neither am I able to find any differences between the latter and a specimen 340 mm. long in Poey's collection in the U. S. National Museum, identified as *S. squalidum* presumably by Poey himself.

Furthermore, I have checked the description and drawing of *Vieja* Parra (Desc. dif. piezas hist. nat., 1787, p. 58, pl. 28, fig. 4), on which Bloch and Schneider (see reference above) based *S. chrysopteron*, against the specimens in hand. Parra did not show in his figure, or mention in his description, a prominent black spot at base of upper rays of pectoral, nor a dark blotch on and behind margin of opercle on the second row of scales above base of pectoral. Neither did he mention canine teeth. The black spot at base of pectoral is prominent in the Tortugas material, and the spot on and behind opercular margin, which often has a light margin posteriorly, is always present also, though somewhat obscure in a few of the larger specimens. These dark spots also remain in the Panama and Cuba specimens. The black spot on the pectoral is mentioned in current descriptions of *S. chrysopteron*, but I find no mention of the spot or blotch above base of pectoral. Poey mentioned it, however, in his description of *Scarus squalidus* (Repertorio, vol. 2, 1868, p. 338). Nevertheless, it is present in *Sparisoma chrysopteron* if Dr. Longley is correct in assigning *S. lorito* to the synonymy of that species.

It has been suggested that the shape of the caudal is different. I fail to find a difference, however, in the specimens with and without canines. In each group the angles, involving 2 or 3 of the outside (upper and lower) rays, are produced, and the rest of the rays are of about equal length. The angles of the caudal become acute at a length of about 150 mm., increasing in length with age, but even in young of a length of about 80 mm., the fin already is much less strongly rounded than in *S. pachycephalum*, for example.

The results of my study of specimens and the literature indicate, therefore, that the only difference remaining is the absence or presence of canine teeth. If the specimens studied consist of two species, as differentiated by the presence or absence of canine teeth, it must be assumed that the teeth develop at widely variable sizes. As Dr. Longley evidently considered all Tortugas specimens *S. chrysopteron*, the largest preserved being 285 mm. long, none of which have canines, it would appear that such teeth at least sometimes appear quite late in life.

Atlantic coast of tropical America northward to Florida.

S. F. H.

***Sparisoma rubripinne* (Cuvier and Valenciennes)**

Scarus rubripinnis Cuvier and Valenciennes, Hist. nat. poiss., vol. 14, 1839, p. 199—Santo Domingo.

Scarus virens Cuvier and Valenciennes, *ibid.*, p. 203—Puerto Rico; Martinique.

Scarus circumnotatus Poey, Memorias, vol. 2, 1861, p. 423—Cuba.

Scarus chloris Guichenot (not of Bloch and Schneider), Mem. Soc. sci. nat. Cherbourg, vol. 11, 1865, p. 14.

Scarus truncatus Poey, Repertorio, vol. 2, 1868, p. 339—Cuba.

Scarus emarginatus Poey, *ibid.*, p. 340—Cuba.

Sparisoma frondosum Gudger (not of Cuvier), Carnegie Inst. Wash. Pub. 391, 1929, p. 191—Tortugas, Florida.

Not uncommon at Tortugas; usually found along the beach rocks west of Loggerhead Key; occurring also on the reef.

The single mark which best distinguishes it is the color of its caudal fin, which is more yellow than that of other parrot fishes. It is highly changeable in coloration. Its color phases are plain, mottled, and striped. In the first the fish is tawny olive above, lighter below; caudal orange-ochraceous, imperfectly banded; anal poppy red; two conspicuous drab bars under lower jaw. It swims in this phase, as it does in the striped, though the latter is displayed rather rarely, and particularly, I think, by small individuals. It is composed of dark median, ocular, and pectoral stripes with light between. The mottled is pre-eminently a resting phase. Two specimens of *Sparisoma rubripinne* show it in Reighard's plate 5, figure 10 (Carnegie Inst. Wash. Pub. 103, 1908, facing p. 296).

West Indies to Florida.

W. H. L.

***Sparisoma pachycephalum* Longley, new name**

(Plate 28, figure 2)

Sparisoma flavescens (not of Bloch and Schneider) Jordan and Swain (part), Proc. U. S. Nat. Mus., vol. 7, 1884, p. 92. Jordan (part), Proc. U. S. Nat. Mus., vol. 9, 1886, p. 47. Bean (part), Bull. U. S. Fish Comm., vol. 8, 1888 (1890), p. 198. Jordan (part), Rept. U. S. Fish Comm., pt. 15, 1887 (1891), p. 672. Jordan and Rutter (part), Proc. Acad. Nat. Sci. Philadelphia, vol. 49, 1897, p. 119. Jordan and Evermann (part), Bull. U. S. Nat. Mus., No. 47, pt. 2, 1898, p. 1639. Meek and Hildebrand, Field Mus. Nat. Hist., Zool. Ser., vol. 15, pt. 3, 1928, p. 758. Jordan, Evermann, and Clark (part), Check list, 1930, p. 433.

Under *Sparisoma flavescens* (Bloch and Schneider) and *Sparisoma squalidum* (Poey), Meek and Hildebrand segregated two species which had long been confused. These names, however, as Poey himself concluded (Enumeratio, 1875, p. 113), appear to refer to a single species first figured by Parra (Desc. dif. piezas hist. nat., 1787, p. 59, pl. 28, fig. 4) and named first by Bloch and Schneider, who based their name on Parra's figure.

Earlier (Repertorio, vol. 2, 1868, p. 349) Poey considered *Scarus squalidus* distinct from *S. flavescens* only because Señor Graells, a correspondent, wrote him that the dorsal spines of the species he called by the latter name were flexible. Earlier still (Repertorio, vol. 1, 1866, p. 376), Poey wrote that he was informed that Parra's type, in Madrid, without posterior canines, was a fish 360 mm. in length, exclusive of the caudal lobes, which were long. This is an observation which, in the light of our present knowledge, would appear decisive.¹ *Sparisoma flavescens* Meek and Hildebrand then lacks a name.

Very common at Tortugas. Often it is especially common on one or two

¹ *Sparisoma flavescens*, which is Longley's *pachycephalum*, was described by Meek and Hildebrand (see reference above) as having no lateral canines; with caudal rounded in young, becoming notably concave, with angles "somewhat produced," in adults. *Sparisoma squalidum* was described also as having no free canines; with caudal in adults concave, with middle rays of about equal length, and "outer rays notably produced." In color the two species, as understood by Meek and Hildebrand, differed prominently in the presence of a jet-black spot at base of upper rays of pectoral in their *squalidum*, which their *flavescens* lacked. Although Dr. Longley did not say so directly, it may be inferred that he considered *S. squalidum* of Meek and Hildebrand equivalent to *S. flavescens* Bloch and Schneider, which he did not report from Tortugas.—S. F. H.

shallow banks and at certain other points on the margin of two large, deep holes between Bird Key harbor and the reef to the east.

About corals I once saw many of these fish lying on the bottom all mottled, matching and blending with their surroundings so well that at least some of them were difficult to see. The mottling, more or less reduced, persisted on some that were swimming off, and on some it was replaced by stripes. The species may appear also in an essential self-color, except for its countershading. The change from one to the other may occur very quickly. Gray, olive, or a brownish cast may prevail in any of the three phases, as one or another is the dominant hue in the environment. In a slate-bottomed aquarium bare at one end, at the other covered with white sand, fish coming to the dividing line repeatedly changed their shade almost as soon as their eyes reached it. In free fish, passing from bare sand to alga-covered bottom, one may see the same adjustment.

Fish commonly rest in their mottling, but may show it when swimming. They commonly swim in stripes, but are not rarely seen "standing" in stripes in a steeply tilted pose which they often assume, and they even show stripes sometimes when resting on the bottom. They may feed in motley, in stripes, in self-color.

W. H. L.

The foregoing was prepared by Dr. Longley. Several marginal notes, however, showed that he did not consider it complete. One note indicated that he thought this species might be *Scarus aracanga* Günther (Cat. fish. Brit. Mus., vol. 4, 1862, p. 209), a matter he apparently decided as shown by the supposedly later pencil note written over the account, "Call this *pachycephalum*," indicating that he had decided this fish definitely needed a name. Accordingly I have inserted the name proposed. (See also first sentence under *Scarus punctulatus*, below.) *Scarus aracanga* was described as having a series of 3 large scales on the cheek. The specimens herein called *S. pachycephalum* have 5 scales in the single series on the cheek. It seems improbable, therefore, that the two are identical.

Preserved specimens of *S. pachycephalum* and *S. rubripinne* are extremely difficult to separate, and I am not sure that I have succeeded.

Atlantic coast of tropical America to Florida and sometimes northward.

S. F. H.

Scarus punctulatus Cuvier and Valenciennes

Scarus punctulatus Cuvier and Valenciennes, Hist. nat. poiss., vol. 14, 1839, p. 144—Martinique.

Scarus diadema Cuvier and Valenciennes, *ibid.*, p. 146—Martinique.

Scarus flavomarginatus Cuvier and Valenciennes, *ibid.*, p. 150—Martinique.

Pseudoscarus taeniopterus Günther (not of Desmarest), Cat. fish. Brit. Mus., vol. 4, 1862, p. 226—Trinidad.

Pseudoscarus aracanga Günther, *ibid.*, p. 227—Jamaica.

?*Scarus bollmani* Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 9, 1886, p. 470—Tampa, Florida.

The types of *Scarus flavomarginatus* and *Pseudoscarus aracanga* are thoroughly representative specimens of *S. punctulatus*.

The type of *Scarus bollmani* is a partly digested fish from the stomach of *Epinephelus morio* caught off Tampa Bay. Its color has faded and its few remaining scales show nothing distinctive, but the description of its color pattern while it was still decipherable seems to identify it with *S. punctulatus*. Like *S. punctulatus*, it has 2 scales in the third row on the cheek; not two rows only, as stated in the original description. Its coloration was very much like that of *punctulatus*; it even had the median row of blue spots on the anal fin. In the synonymy of *Scarus punctulatus*, *S. bollmani* may rest for the present, though with the understanding that north of the Florida Strait *S. punctulatus* seems not to grow large, is perhaps a little brighter in color, and probably develops fewer posterior canines.

This species is surpassed in numbers at Tortugas by none of the genus except *S. croicensis*. When actively moving about in the field it has a green stripe running horizontally from upper angle of opercle to dorsal margin of orbit and thence forward to meet its fellow of the opposite side, rather definitely continued posterior to opercle to base of caudal; a second stripe similar and parallel to the first, extending from below posterior angle of opercle beneath eye to angle of mouth, there dividing into branches following upper and lower lips, sometimes carried backward on body. If the lower stripe is not well developed, a notable red patch on side above and behind pectoral, reaching vertical of vent, is present. When the stripe is distinct, the red patch, split lengthwise, is largely suppressed and dorsal, ocular, and pectoral dark stripes, separated by light ones, are present. The fish is browner among brown algae and gorgonians, grayer over sandy bottom. Its changes in shade, however, are not nearly as pronounced as those of some other species. One fish in a blotched phase was seen on the reef.

West Indies to Florida.

W. H. L.

Scarus caeruleus (Bloch). BLUE PARROT FISH

Rather widely distributed at Tortugas. It may come in to the very shore, where it is rocky; occasionally seen about the sparsely scattered coral patches on Bird Key flats, but more commonly observed feeding with other parrot fish along the reefs paralleling the western shore of Loggerhead Key. The largest individuals, however, with a great bump on the snout and strongly exserted angles to the caudal, generally were seen only near deep water at such places as the *Palythoa*-covered ledges where Long and Bush keys meet, or at the northern end of White Shoal.

Feeding is almost continuous throughout the day. The food is usually taken a little at a time as the fish browse over the bottom, but near the dock at Fort Jefferson a mixed school of blue parrot fish and guacamaïas repeatedly swam in from the channel and went off with mouthfuls of filamentous algae. Although sometimes the fish take food whose nature is obvious, I have seen them feeding actively on what seemed a perfectly bare sand patch, taking up mouthful after mouthful of fine sand, grinding it to powder in their pharyngeal apparatus, and treating the whole with their digestive juices, presumably for the microscopic food in it.

A single fish, 3 to 4 inches in length, was observed showing the pattern of stripes common among parrot fishes. Usually the coloration in this species is nearly uniform robin's-egg blue, washed with yellow on the occiput, and showing inconspicuous evidences of stripes about the snout. Yet other phases occur, for a specimen about 250 mm. long resting among rocks in a tank in the New York Aquarium displayed a pattern in which half a dozen light blotches appeared plainly on the dorsal fin and dorsal half of the body. Another phase is a very pale one, observed once only in fish in comparatively deep water.

West Indies to Florida, sometimes straying northward.

W. H. L.

Scarus croicensis Bloch

(Plate 29, figure 1)

Scarus croicensis Bloch, Naturgesch. ausland. Fische, vol. 4, 1790, p. 27, pl. 221—St. Croix.

Scarus insulæ-sanctæ-crucis Bloch and Schneider, Syst. ichth., 1801, p. 285—St. Croix.

Calliodon lineatus Bloch and Schneider, *ibid.*, p. 312, pl. 62, fig. 2.

Scarus alternans Cuvier and Valenciennes, Hist. nat. poiss., vol. 14, 1839, p. 200—Martinique.

Pseudoscarus lineolatus Poey, Repertorio, vol. 2, 1867, p. 239—Cuba.

?*Scarus evermanni* Jordan, in Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 9, 1886, p. 469—Snapper Banks off Tampa Bay, Florida.

Callyodon margarita Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 69, 1917, p. 133, fig. 2—Colon, Panama.

Callyodon emblematicus Fowler (not of Jordan and Rutter), *ibid.*, vol. 80, 1928, p. 472—St. Lucia; *ibid.*, vol. 82, 1930, p. 275—Grenada.

Even from his partly digested type of *Scarus evermanni* Jordan inferred that his specimen was very close to *S. croicensis*. So close, indeed, are they that perfect specimens of *evermanni* seem without exception to have been passed as *croicensis* by Jordan and his collaborators. Whether the two, however, are identical is a question taken up again below.

Scarus evermanni Jordan is the commonest parrot fish at Tortugas. In company with *S. punctulatus* it abounds over the reefs. The young occur in *Thalassia* about Long Key and adjacent islets.

A pattern of stripes is almost conventional dress. The dark ocular stripe is separated by light interspaces from similarly colored dorsal and pectoral stripes, and ventrally the countershaded body verges toward white. Low on the side are three sharp, thin dark lines on as many rows of scales. When the fish is swimming, the striped pattern may be replaced by self-color, of which the brown or gray repeats the color of alga-covered or sandy bottom. In a gray phase with yellow wash over the snout, the fish are very like young and pale *S. caeruleus*. Sometimes the swimming fish may show a tendency toward mottling. This has not been seen fully developed in free fish, but at night in tanks the mottled pattern appears, wherein the nape and top of head are light, with three vertical lines on the cheek, dividing the head into sectors; body banded, the two foremost bands, under anterior part of dorsal, united to form a Y; two others, also under dorsal; and two on caudal peduncle; iris changeable with the general shade of body.

Scarus croicensis is widely distributed in the West Indies. Besides other lots,

the Museum of Comparative Zoölogy has 8 specimens from Havana and 8 from the Barbados, with an average length of 187 mm. for the 16 and a maximum of 215 mm. One Cuban specimen and 1 from Barbados, each at the length of 185 mm., have 2 posterior canines on one side; and 1 of the latter, at 215 mm., has 1 on each side. These observations show that, contrary to descriptions, these teeth are sometimes developed by this species.

The type of Fowler's *Callyodon margarita*, 138 mm. long, I think is another of these exceptional specimens, with 3 posterior canines on one side and 4 on the other. In this opinion I am supported, in effect, by Fowler's independent judgment, since he has referred *margarita* to synonymy under *emblematicus*, although his *emblematicus* is surely *croicensis*, represented by 2 specimens, 166 and 174 mm. long, without canines, in the Academy of Natural Sciences, Philadelphia.

At Tortugas *S. evermanni* attains a scant two-thirds of the length reached by *S. croicensis* south of the Florida Strait. In a sample of 7 specimens from Tortugas in which the scales in the short row on the cheeks were counted on each side of each specimen, the following results were obtained: 3 scales appeared 2 times, 2 scales appeared 11 times, and 1 only 1 time. By contrast, in 16 Havana and Barbados fish, 4 scales appeared 11 times in this row on the cheek, and 3 scales appeared 9 times. In 6 specimens from Puerto Rico, 3 scales were present 4 times, 2 appeared 7 times, and only 1 was present 1 time. Therefore, the difference that seemed to appear between the first two lots from different regions, coinciding with the greatest barrier in the region, fails to be substantiated by the specimens from Puerto Rico.

If the Puerto Rican material is correctly assigned to *croicensis*, only the prevailing difference in size and in the color of the three fine stripes on the side of the belly remain to distinguish the two. But the black-streaked form is found as far south as Curaçao, where Van der Horst collected 6, 105 to 130 mm. long, now in Amsterdam. In these, the third row on the cheek has 3 scales once, 2 scales 9 times, and 1 scale once only.

On the relation of *S. evermanni* to *S. croicensis* little more may be said profitably until material is available in wider range of sizes from the same or other localities. Until then it must remain an open question whether the species are two or one. In the latter case *S. croicensis* appears to be represented by a somewhat depauperate race in the northern and western part of its range.

Panama, West Indies, and Florida.

W. H. L.

Scarus acutus Poey

Scarus acutus Poey, Memorias, vol. 2, 1860, p. 216—Havana.

Pseudoscarus gnathodus Poey, Repertorio, vol. 2, 1867, p. 240—Havana.

This species, which may or may not develop canine teeth, includes *Pseudoscarus gnathodus*, separated from it largely on the supposition that it developed canine teeth, which *Scarus acutus* failed to do.

It is one of the less common parrot fishes. The young sometimes join mixed schools of *S. croicensis* and *S. punctulatus* on the reefs, and are very similar to the dark-tailed phases of the former.

According to Poey, *S. acutus* is violaceous with a broad whitish lateral band.

This is, indeed, the phase in which the larger specimens commonly appear, the white band being an ill-defined light blaze on the side, including the pectoral. But even the larger ones sometimes, and the small ones usually, show the coloration ascribed to *P. gnathodus*, that is, brown, with a clear brown line along the middle of the trunk and another along the lower part of the belly.

When the transition from the *acutus* to the *gnathodus* pattern occurs, a dark stripe comes in through the pectoral base in the area of the light blaze. The fish may swim or feed in the striped phase, but the correspondence of either of the two phases mentioned, or of the self-colored phase which results when the blaze is reduced, to any particular state of activity has not been determined.

West Indies to Florida.

W. H. L.

Pseudoscarus guacamaia (Cuvier)

Guacamaia Parra, Desc. dif. piezas hist. nat., 1787, p. 54, pl. 26—Cuba.

Scarus guacamaia Cuvier, Règne animal, 2d ed., vol. 2, 1829, p. 265 (based on Parra).

Scarus turchesius Cuvier and Valenciennes, Hist. nat. poiss., vol. 14, 1839, p. 134—Puerto Rico.

Scarus pleianus Poey, Memorias, vol. 2, 1861, p. 393 (based on *S. guacamaia* Cuvier and Valenciennes).

The name *Scarus pleianus* was proposed by Poey for a fish he had not seen, but of which he read that it occurred in St. Thomas and had freely projecting posterior canines in the upper jaw. This fish had been identified from a skin by Valenciennes as *guacamaia*. The presence of canines was a matter of consequence to Poey, though not to Valenciennes, because Poey knew that the Cuban species, which Cuvier, without seeing any specimen, had called *Scarus guacamaia*, usually if not always lacked such teeth. But, apart from its faded colors, the century-old skin in Paris seems that of normal *S. guacamaia* in all but its teeth. It seems to be a large and old fish, displaying in its teeth an individual variation or a mark of its age.

This fish is among the least abundant of the family at Tortugas, but far from rare. It was seen at the beach rocks below the east lighthouse dock, in 4 or 5 feet of water under submerged dead mangroves at the beach on Boca Grande, and elsewhere, but in general it is most numerous and the largest individuals are found at the offshore coral heads below the east lighthouse dock, the great reef patch farthest up the Loggerhead shoal, the heads just within the tip of Bush Key, and places along the outer face of Bird Key reef.

In coloration the adults are more brilliant than the young and usually appear in a phase in which the red or reddish brown of the head shades into green over the body. The only change observed was in shade. On a specimen 450 mm. long, first seen resting under a coral head, the red, particularly on the head, became brighter as the fish swam away, whereas others became paler over a bottom of sand. The red and green did not disappear, however, but were only dimmed. But in the New York Aquarium I have seen the young, up to at least 300 mm. in length, in a mottled phase.

Filamentous algae constitute at least a part of the food, as several individuals were seen swimming in from the ship channel to the dock at Fort Jefferson, taking mouthfuls of the algae, and swimming back with strands of the plant trailing behind them.

West Indies to Florida.

W. H. L.

***Pseudoscarus coelestinus* (Cuvier and Valenciennes)**

Scarus coelestinus Cuvier and Valenciennes, Hist. nat. poiss., vol. 14, 1839, p. 134—St. Thomas.

Scarus rostratus Poey, Memorias, vol. 2, 1860, p. 221—Cuba.

Pseudoscarus simplex Poey, Repertorio, vol. 1, 1865, p. 185—Havana.

Pseudoscarus plumbeus Bean, Proc. Biol. Soc. Washington, vol. 25, 1912, p. 125—Bermuda.

The type of *Scarus coelestinus* is a mounted specimen in good condition and recognizable immediately, though some of its light blue markings have turned green. *Pseudoscarus plumbeus* and *S. simplex* are quite the same thing. A mounted specimen of the latter, 690 mm. long, received from Poey, is in the Museum of Comparative Zoölogy.

Scarus rostratus is a name which has been in synonymy under *Pseudoscarus guacamala*, which seems incorrect, as the combination of very bright blue with blue to nearly black on the head, together with blue teeth, leaves little doubt regarding its identity with *P. coelestinus*.

This is much the commoner of the two Tortugas species of *Pseudoscarus*. It may be seen sometimes about the ledges of beach rock, commonly about large coral heads south of the eastern lighthouse dock, also on the western side of White Shoal, and most commonly on the outer face of Bird Key reef and on the rugged seaward front of the junction between Long and Bush keys, always accompanied by large *Hepatus coeruleus*, whose blue-black is the same as their own ground color.

The shade of *P. coelestinus* and the pattern of light blue markings on dark blue is apparently unchangeable.

W. H. L.

To the foregoing apparently incomplete account may be added from Dr. Longley's field notes the description of the color of a fresh specimen of unstated size: Slate color above, becoming ashy gray on sides and belly; most of scales with light blue marks in center, these larger and more intensely blue on sides; dorsal, anal, anterior margin of ventral, and posterior margin of caudal edged with bright blue; jaws dark blue, narrowly white on the cutting edge; lips narrowly dark-margined; snout and throat light blue with a slate-colored strap under the chin; and irregular blue markings on the occipital region.

Dr. Longley has the following concerning the food: A bit of material found in the pharyngeal grinding apparatus consisted of coarse sand, far coarser than that found in the intestine, and fragments of algae of perhaps a half-dozen genera. The only animal remains observed was one small amphipod.

West Indies, Bermuda, and Florida.

S. F. H.

Family ELEOTRIDAE

Eviota personata Jordan and Thompson

Of this species, known hitherto from the type only, 10 specimens were taken, and others seen, mostly under the overhanging flank of a great isolated coral head on the eastern margin of the bank just off the Laboratory. They swam about freely in the shadow under the coral, although to escape pursuit they fled to its surface to "creep" about or hide in its crannies.

The largest male taken was 31 mm., the largest female 37 mm. long, though sexual maturity is attained in the female at 23 mm., or possibly less.

The 2d dorsal spine in the male reaches the base of the 3d ray of second dorsal, and in the female it reaches the second dorsal only. The male genital papilla is long and pointed, and that of the female broad and short, covered with small papillae. The caudal fin in both sexes is slightly emarginate. D. VI-I, 10 or 11; A. I, 10 or 11.

In nature these fish were observed only in the color phase described below; in the laboratory the light stripes mentioned may vanish, as they do at death. After death the tissues become opaque and the pattern appears as in the original description (Jordan and Thompson, Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 251, fig. 3).

The superficial color is little developed. Tip of snout above and before eye with a few dark pigment cells, extending ventrally slightly below orbital margin; cheek below this pigment pale, above it dusky chromatophores, more sparsely distributed dorsally, extending to posterior margin of preopercle, a few forming a short, poorly defined horizontal line on pectoral base; a few red color cells on conjunctiva above; others, inconspicuous and widely scattered over body, tingeing it slightly with rose; a black line, slightly oblique and of width of pupil, extending through eye; scarlet on meninges, peritoneum, and vertebral axis, and in the median plane just beneath it from abdominal cavity to base of caudal; a silvery line behind pectoral base, bordered ventrally with scarlet, apparently continuous posteriorly with a median light stripe between the subvertebral red and a series of dark points along base of anal; a dark spot on ventral surface before anus. This clearly is a fish whose pattern is mostly internal, in life visible only through its transparent bone and muscle.

W. H. L.

The collection contains 5 specimens, 35 to 42 mm. long. This species has been described and figured as having no scales on the head, nor in advance of the dorsal, and none on base of pectorals and breast. This indeed may be true of the young, but in the adult the nape to interorbital space, and the cheeks, gill covers, and breast are fully scaled.

Known only from Tortugas, Florida.

S. F. H.

Ioglossus calliurus Bean

Known hitherto only from the Snapper Banks off Pensacola, Florida, in rather deep water. It is not uncommon at Tortugas. As it is a burrowing form, or one at least which shelters itself in holes in the bottom, it fails to be seen or caught in

nets. It has been observed a few feet seaward from low-tide mark on Loggerhead Key and on the flats and banks in the deep hole east of Bird Key, and full-grown specimens most commonly on patches of gravel washed free of fine sand near the bases of coral stacks, in the deeper holes on the northern part of Loggerhead bank, and on parts of the comparatively barren eastern half of the bank.

The burrows, which it was not actually seen excavating, are irregular holes under or between coral fragments. When undisturbed the fish "float" above their retreats. When alarmed they sink and assume a horizontal position, or with the head slightly inclined downward, ready to dart out of sight with almost incredible speed on the closer approach of danger. They are not readily driven out of their burrows by stirring up the sand about them, nor do they attempt to escape when copper sulphate is injected. They are, indeed, collected with considerable difficulty, except with dynamite.

Two adult fish commonly live together, and often smaller ones attach themselves to the pair. Seven young, of two sizes, were seen once, and 5 to 7 of uniform size were repeatedly seen sharing the refuge of their elders.

The young, at the length of 25 mm., have the caudal fin slightly forked, therein differing greatly from the adult, in which this fin is lanceolate. W. H. L.

Hildebrand and Cable (Bull. U. S. Bur. Fish., vol. 48, no. 24, 1938, pp. 548-574) and Hildebrand (Field Mus. Nat. Hist., Zool. Ser., vol. 22, 1938, pp. 345, 348) have described the development of the caudal fin in several species of Eleotridae and Gobiidae as similar to that in *Ioglossus calliurus*. It would appear that a concave or truncated caudal in the juveniles of those species that in adult life have a rounded or lanceolate caudal is usual among gobies. This mode of development is opposite to that of many other groups of fish.

The following concerning color was compiled from Dr. Longley's notes: General color olivaceous; a bluish-stripe, half the width of pupil, extending from eye to upper angle of gill cleft; several small dots of blue on opercle; frilled membrane from tip of chin to isthmus blue and orange. Both dorsals with conspicuous dark margins, the rest of fins pale olivaceous like the body, except for very faint blue longitudinal lines; ventrals and lower two-thirds of caudal rosy, upper third of caudal like the body.

A "large specimen" is described as having the margin of first dorsal rosy, and anal and lower half of caudal also rosy. In still another specimen the dorsal was described as having a black margin only on the last 13 "spines," presumably meaning the last 13 rays of the second dorsal. In this specimen the lower half of the caudal and the entire anal were ruddy.

The 5 preserved specimens at hand, 40 to 103 mm. long, are now entirely colorless, except for a prominent black margin extending the full length on both dorsals in the largest and smallest specimens, present only on the posterior half in a 51-mm. fish, and entirely missing in one 83 mm. long.

The following enumerations based on 2 specimens are recorded in Dr. Longley's notes: D. VI-1,22, VI-1,23; A. I,22, I,22. I have counted in 2 specimens, D. VI-1,22, VI-1,23; A. I,21, I,22.

The specimens have a low dermal crest, precisely like *Coryphopterus glauco-*

fraenum, discussed on page 232, and the last spine of the first dorsal is far removed (though attached by membrane) from the others, as in some of the gobies with united ventrals, for example *Gobionellus boleosoma*.

Known from Pensacola and Tortugas, Florida.

S. F. H.

Family GOBIIDAE. GOBIES

Bathygobius soporator (Cuvier and Valenciennes)

Found in tide pools along the shores of Loggerhead Key, on the flats near Long Key and Bird Key reef, and very common up to the length of 115 mm. on the reef top itself. It is a surprisingly hardy fish, which will live for weeks without food or attention in a pale of evaporating sea water and, if released, swim away as if nothing had happened.

Its coloration is very variable. Sometimes a gray phase is shown, finely mottled over the back and with distinct brassy streaks along lower part of side. Sometimes two dark bars stand out distinctly in the pattern, a broad one under spinous dorsal, and a narrower one under middle of soft dorsal. The shade varies with that of the substratum, the adjustment being effected quickly. For example, fish that had been in a black dish, when transferred to a white one became in a little more than a minute as pale as others that had been in the white dish for some time.

Both coasts of tropical America, on the Atlantic northward to Florida.

W. H. L.

Bathygobius curacao (Metzelaar)

Common inside Bird Key reef, where it may be seined in breeding condition in June and July. The largest female secured was 58 mm. long, the largest male 65 mm.

There is little tendency to depart from the fin formulas D. VI-I,9; A. I,8. The pectoral has once 16 and 7 times 17 rays in a series of 8, and the upper rays are free and form a fringe, a detail overlooked by Metzelaar in his description; scales from pectoral axil to base of caudal 31 to 33, with 10 in an oblique row between anal origin and base of second dorsal. Teeth in villiform bands, the outer ones being enlarged and distinctly spaced in the male. Conspicuous mucus pores on head almost identical in arrangement with those in *B. soporator*, consisting of a vertical row on opercle at its anterior margin; a few others in an oblique line near its upper angle; a suborbital series rising to a point behind eye and with some interruption continuing horizontally to above margin of operculum; another series from nostril along preorbital margin to cheek, where there are three series, the median one divided posteriorly; a double series along and under lower margin of mandible, both continuing along lower border of preopercle.

This fish is changeable in shade and, to some extent, in pattern. In its simplest phases it is very finely mottled over the head and has a finely striped pattern of alternate light and dark lines on the trunk, where the light elements follow the longitudinal rows of scales and the pencilings of darker ground color lie between. On this foundation bars may be superimposed, consisting of a dark band

across nape, a pair across back between pectorals and dorsal origin, another pair under first dorsal, two pairs under second dorsal, and a simple band on caudal peduncle. In phases dark enough for the contrast to appear, the two dorsal fins are margined with pale yellow, otherwise marked, like caudal, with many fine lines of brown across the rays and dark spots on anterior support of each; rows of white spots cross pectorals.

The sexes are readily distinguishable, as in the male the dorsal and anal lobes are elongate, reaching to or beyond base of caudal; the median caudal rays are slightly longer proportionately than in the female, which tends to make the fin lanceolate rather than simply rounded; and in the male the ventral fin is longer by half, reaching the anal origin, and is dark instead of white. The anal fin, too, is much more heavily pigmented except along its pale free border. The urogenital papilla of the male is long and pointed, whereas that of the female is broad and flat with a brush of slender papillae at either external angle.

The Bingham Oceanographic Collection contains a specimen of this species from Glover Reef; the collection of the New York Zoological Society includes one from Bermuda; and in the Museum of the Academy of Natural Sciences, Philadelphia, are two, collected in the Bahamas. Jordan and Evermann possibly had it from Pensacola, Florida, though I have been unable to find their specimens. Their *Gobius saporator* (Bull. U. S. Nat. Mus., No. 47, pt. 3, 1898, p. 2217), with 30 scales in linear series and twelve rows between the first dorsal and the anal origin, if correctly described, can scarcely be any other species. W. H. L.

This species is distinguished from *B. saporator* principally by the fewer scales in a lateral series. In 4 specimens of *B. curacao* from Tortugas there are 32 or 33 series of scales between axil of pectoral and base of caudal, whereas in 2 specimens of *B. saporator* there are 37 and 38.

Curaçao, Glover Reef, Bahamas, Bermuda, and Florida.

S. F. H.

Gnatholepis thompsoni Jordan

This species is sparingly scattered, and usually found singly, throughout the group where dead corals on sandy bottom provide it shelter.

Judging by the amount of freshly excavated material which sometimes was seen, these fish often burrow freely. A single fish may have two shelters not far apart, and it may be found at the same spot day after day. The mouth is protrusible and sucker-like, and much sand is taken up, from which the material the species seems to feed upon is sorted.

This goby is very changeable in shade and in a lesser degree in pattern. Its distinctive mark is a narrow black line crossing the interorbital space and the dorsal surface of the eyes at right angles to the main axis of the body. In very light color phases this line is drawn sharply on the iris above and below the pupil and on the cheek below. When so drawn, its breadth is notably less than that of the pupil, which is highly unusual. In dark phases it is lost on the iris and becomes a mere diffuse blur on the cheek, being broadest ventrally.

The basic pattern on the trunk is one of minute brassy spots on a light ground, in series following the longitudinal rows of scales. In all but the lightest phase

the spots unite to form brassy streaks. In pale phases a narrow dusky line on the head runs back from the eye, and from above the pectoral continues as one of the chief of the longitudinal streaks. At other times the part of this streak before the pectoral stands out as a distinct dark line on the head. A line from the angle of the mouth, also variable in intensity with the general shade of the fish, runs across the cheek parallel with the other, and behind the pectoral is continued by a series of six diffuse dusky spots continuing to the caudal peduncle. A series of ten transverse broken bars, of the average width of the eye, is variably developed across the back, chiefly according to the shade of the substratum. W. H. L.

The collection contains 4 specimens, 55 to 58 mm. long, which retain the darker color markings essentially as described above for the pale phase. D. VI-12; A. 12; scales 28, in oblique series between origin of anal and base of second dorsal 10.

Known only from Tortugas, Florida.

S. F. H.

***Elacatinus oceanops* Jordan**

Common everywhere on large coral heads, on the surface of which it rests or "creeps." It goes sometimes into the empty burrows of *Lithophagus*, the boring mussel, and it occurs also in some of the gorgonian patches. Wherever found, these small fish slip out from shelter, attach themselves by their ventral disks to other fishes, and "creep" over them, presumably to look for parasites. As many as 6 have been seen together on a *Mycteroperca venenosa* about $\frac{3}{4}$ yard long. *Epinephelus morio*, *E. striatus*, *Lachnolaimus maximus*, *Pseudoscarus guacamaia*, *Haemulon sciurus*, *Pseudupeneus maculatus*, *Sparisoma pachycephalum*, *Acanthurus caeruleus*, and *Brachygenys chrysargyreus* also are sometimes inspected.

Some copepods are rather common ectoparasites of fishes. The pursuit of the parasites is with little doubt the business of *Elacatinus*, but this is more difficult to prove than it would seem. I have not been able to forge the last link. The boldness of these tiny fish is almost incredible. They will creep over the teeth of the great *Pseudoscarus*, or enter the mouths of grunts and groupers and explore them with unhurried movements. Their fitful creeping, or perhaps the nipping of their teeth, is a minor irritation, possibly a sort of tickling, evidenced by a certain tenseness, and shown by broadly gaping jaws and raised gill covers when the inspectors are within the mouth. Their attentions usually continue until the larger fishes grow restless, start up abruptly, or move away and leave them, whereupon they return to their original stations.

Elacatinus oceanops apparently displays only one color phase, its pattern consisting of alternating dark and light blue stripes. Of these the dark ones are three, median, dorsal, and lateral, all running the full length of the body. The dark lateral line passes through the eye and includes the pupil; the light lines touch the eyes as well, and include parts of the dorsal surface. W. H. L.

The collection contains 20 specimens, ranging in length from 28 to 48 mm.

Known only from Tortugas, Florida.

S. F. H.

***Elacatinus horsti* (Metzelaar)**

Gobiosoma horsti Metzelaar, Bijdr. Dierk. Amsterdam, vol. 22, 1922, p. 139, with fig.—Curaçao.

Gobiosoma chancei Beebe and Hollister, Zoologica, vol. 12, 1931, p. 87, fig. 17—St. George's Bay, Grenada.

Gobiosoma (Elacatinus) horsti Ginsburg, Bull. Bingham Oceanog. Coll., vol. 4, art. 5, 1933, p. 22.

A female, 37 mm. long, was taken east of Bird Key reef and Bush Key, at a depth of 13 to 14 fathoms. This species was taken also in the 10-fathom channels within the lagoon.

D. VII-13; A. 12. Graded in color from black or indigo blue dorsally, through ultramarine blue from upper margin of pectoral base, to the pale ventral surface, the darkest pigment continuing to tips of median rays of caudal; a median dash of sulphur yellow extending from tip of snout nearly to interorbital space; a line of the same color, at its widest exceeding diameter of pupil, running from dorsal surface of eye to caudal base, just above its mid-point. W. H. L.

Two specimens, 27 and 31 mm. long, are in the collection. Though this species is close to *Elacatinus oceanops*, it may be distinguished by the subterminal mouth, not decidedly inferior as in *oceanops*, and by the much narrower and more sharply outlined pale (sulphur yellow in life) line extending from behind upper part of eye to caudal. This line scarcely exceeds the width of the pupil, whereas the less definite pale (light blue in life) line or band in *oceanops* is almost as wide as the eye where it is broadest. The ventral disk is proportionately much longer in *horsti* than in *oceanops*. In the first-named species it extends nearly to vent, and in the second it reaches only about a third to half the distance to vent.

West Indies and Florida.

S. F. H.

***Tigrigobius macrodon* (Beebe and Tee-Van)**

Gobiosoma multifasciatum Metzelaar (not of Steindachner), Trop. atl. Vissch., 1919, p. 139—Curaçao; Aruba.

Gobiosoma macrodon Beebe and Tee-Van, Zoologica, vol. 10, 1928, p. 226, with fig.—Port-au-Prince-Bay, Haiti.

Infrequently seen, but scarcely rare. It may be found under *Diadema setosum* in eroded *Orbicella* heads. When the covering urchin is taken away, the fish almost immediately slips into a crevice in the coral, but may occasionally be caught by inverting a test tube over it before it finds shelter.

In 3 specimens the fin formulas were: D. VII-11 or 12; A. 10 or 11.

Color in life very pale blue, crossed usually by seventeen narrow vertical dark blue or black lines, regularly arranged at distances of about four times their own width. The flesh is translucent, but the internal color pattern is not elaborately developed. A mark is present upon the meninges, however, two blotches occur on the peritoneum (united above), and seven dashes of pigment extend along the vertebral axis. W. H. L.

The collection contains 2 specimens, 18 and 21 mm. long. The general color has faded to a yellowish straw color, and the crossbars to dark brown or nearly black, remaining very distinct.

West Indies and Florida.

S. F. H.

Gobiosoma longum Nichols

This goby lives commensally with a shrimp that is common and tirelessly burrows in the soft mud covering the bottom of deep holes in Bird Key flats. Usually a single fish is found with one or perhaps two shrimps in a burrow. Sometimes two fish, and in rare instances more than two, quarter themselves on a pair of shrimp. In its indolence the fish is always quite the antithesis of the crustacean. For long intervals it will rest near the mouth of a burrow without moving. If "sitting" very near, it may even be pushed aside by the shrimp in its coming and going.

These gobies are not easy to catch. When alarmed they whip quickly out of sight and cannot be driven out by squirting irritating chemicals into their hiding places, and it is useless to attempt to thrust one's arm into their shelters, as under the surface of the soft mud there is rasping coral scrap not easily moved. This goby sometimes may be caught by creeping up cautiously without alarming it, and from a distance of 2 yards or so pushing a rod into a burrow to block the lower part. If the burrow is not blocked too near the surface, the fish will enter, and then by probing it may be driven into a glass jar inverted over the mouth of the pit.

Basically sand-colored, translucent, countershaded in faint olive, with darker bands of spots more rounded dorsally, more elongated vertically on sides or fused to form large blotches; bands plainer in resting fish.

The stomach of one specimen contained a small gastropod, 2 amphipods, and a small oxyrhynchous crab.

W. H. L.

The collection contains 11 specimens, 45 to 80 mm. long. Recognized by its extremely slender body, depth in standard length about 6.7 to 8.5, and by the filamentous 1st dorsal spine, which reaches to or beyond origin of second dorsal.

Dutch West Indies, Bermuda, and Florida.

S. F. H.

Risor Ginsburg

Risor Ginsburg, Bull. Bingham Oceanog. Coll., vol. 4, art. 5, 1933, p. 56 (*Garmannia binghami* Parr).

Teeth in a single series, the anterior ones enlarged, movable, strongly curved up and down respectively in upper and lower jaws. Lateral teeth moderate, pointed, recurved at their tips. Lips fleshy. Scales ctenoid, restricted to the posterior half of the body.

W. H. L.

Risor ruber (Rosén)

Garmannia rubra Rosén, Acta Univ. Lund., Årsskr., vol. 7, 1911, p. 50, figs. 1a, 1b—Bahamas.

"?Microgobius sp." Metzelaar, Trop. atl. Vissch., 1919, p. 138—Curaçao.

Garmannia binghami Parr, Bull. Bingham Oceanog. Coll., vol. 3, art. 4, 1930, p. 124, fig. 34—Crooked Island, Bahamas.

Garmannia (Risor) binghami Ginsburg, Bull. Bingham Oceanog. Coll., vol. 4, art. 5, 1933, p. 58.

Garmannia (Risor) rubra Ginsburg, *ibid.*, p. 59.

This small species has been described in detail and clearly figured by Parr. It has been found repeatedly among sponges and algae secured in the 10-fathom channel between Loggerhead Key and White Shoal. The largest specimens taken were only 23 mm. long.

Body compressed; head little depressed; cheeks inflated; profile steep from above eye, and slightly rounded before it; scales in about seven series between bases of anal and second dorsal, and seventeen in lateral series; scaled area tapering forward to mid-level on side and below interdorsal space; dorsal and ventral surfaces of caudal peduncle fully scaled.

The fin formulas are, D. VII-I (occasionally VI), $10\frac{1}{2}$ to 12; A. $1, 9\frac{1}{2}$ or 10. First dorsal spines delicate, slightly if at all exerted, elongate in none; pectorals long, reaching slightly beyond ventrals, which in the male reach the vent.

Color usually brownish, with punctulation of scattered chromatophores; iris dusky.

Dutch West Indies, Bahamas, and Florida.

W. H. L.

***Evermannichthys metzelaari* Hubbs**

Evermannichthys spongicola Metzelaar, Trop. atl. Vissch., 1919, p. 139, figs. 39, 40—Curaçao (name preoccupied).

Evermannichthys metzelaari Hubbs, Occas. Papers Mus. Zool. Univ. Mich., No. 144, 1923, p. 1 (substitute name).

Common at Tortugas in loggerhead sponges.

The largest of 5 in one sponge was 27 mm. long. The 5 showed the following variation in fin formulas: D. VI-14 or 15; A. 10 to 12; P. 11 or 12. Scales strongly ctenoid and limited to a patch of approximately 20 in about five rows covering the ventral and lower lateral surfaces of caudal peduncle.

The color pattern includes surface and internal elements. The former consist of a series of bands, varying among specimens, but differing little from Metzelaar's description (see reference above). This system is capable of being very largely suppressed through contraction of the chromatophores, and when this occurs the internal pattern is visible in detail through the transparent tissues. Its chromatophores are in the meninges of the brain, on the peritoneum, and along the axial column, and form nine or ten blotches and bars broader than and quite as distinct as those of the other series.

From the stomach of one specimen about 20 fish eggs were recovered, which possibly were the eggs of some blenny.

W. H. L.

Three specimens, respectively 21, 23, and 24 mm. long, are included in the collection. General color of preserved fish pale; vertically elongate dark spots along back, another series of dark spots on middle of side. In 1 specimen the spots of the two series are more or less united, forming crossbands on caudal

peduncle. All 3 specimens have wavy dark crossbars on caudal fin. Both dorsals and anal dotted with black; pectorals and ventrals colorless. The internal color, of course, is not visible in the preserved specimens. It is evident from Metzelaar's description and figures that some specimens have more distinct crossbars than the ones at hand.

In addition to the color markings, this little fish, which apparently grows only a little more than an inch (27 mm.) in length, is recognized by the very slender body (depth in standard length about 8 to 10), pointed snout, and rather large oblique and nearly terminal mouth.

Dutch West Indies and Florida.

S. F. H.

Gobionellus boleosoma (Jordan and Gilbert)

Gobius boleosoma Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 5, 1882 (1883), p. 295—Pensacola, Florida.

Gobius encaomus Jordan and Gilbert, *ibid.*, p. 611—South Carolina.

Gobionellus boleosoma Ginsburg, Bull. Bingham Oceanog. Coll., vol. 4, art. 2, 1932, p. 23. (This publication contains a full synonymy of this species.)

Although Dr. Longley did not list this species, there is a specimen in his collection, about 50 mm. long, in bad condition. According to Ginsburg, reviser of the genus, who saw this fish, it almost certainly belongs to this species. As there is no label with the specimen, the exact place of capture is unknown. Its condition indicates that it may have been recovered from the stomach of a fish.

The fin formulas are D. VII-11; A. 11. Scales lost in part, about 33; some teeth in upper jaw anteriorly enlarged; none enlarged in lower jaw; apparently none of dorsal spines produced. According to Ginsburg, the usual number of spines is 6, 7 being unusual.

Color grayish; a large, conspicuous black spot at shoulder; head and sides with smaller and much less conspicuous dark specks and markings, with suggestions of a series of larger dark spots along middle of side; dorsal fins and caudal with dark markings.

Panama to North Carolina.

S. F. H.

Gobionellus stigmaticus (Poey)

Seven specimens, 2 males and 5 females, 132 to 138 mm. long, were taken from a small patch of muddy bottom inshore, in about 10 feet on the west side of Loggerhead Key. The fish moves about freely over the bottom, and occupies small vertical holes of unknown origin, but does not return to the same one after its frequent excursions.

D. VI-1,12, except in 2 specimens having respectively 1 ray more and 1 less; A. I,11 in 1, 1,12 in the others; rays of soft dorsal and anal barely reaching caudal; scales about 30, none in mid-line before dorsal fin, or on side in advance of pectoral base; side of upper jaw anteriorly with 3 or 4 rather strong incurved canines, and a double row of similar but smaller teeth throughout the length of the jaw, the outer larger; lower jaw with small incurved teeth in a villiform band of several rows, the 5 or 6 outer anterior teeth on either side enlarged; first

3 dorsal spines in the male elongated, the 3d one extending much beyond the others, sometimes reaching base of 6th ray of second dorsal or beyond; longest spine barely reaching origin of second dorsal in largest female.

This species, if on clear white bottom, is nearly as light as the bottom. It is finely mottled with gray and has a few distinct dark brown or black spots as follows: a narrow line from below eye to angle of mouth; dark spots on iris below and above pupil; a small dark spot under opercle, and a series of six or seven linear dashes, shorter than the interspaces, extending from pectoral axil to middle of caudal base; several narrow dark lines extending downward and backward on dorsal fins; caudal fin barred similarly.

The male is mature at a length of 25 mm., or possibly less, and the female at little over 30 mm. Breeding was under way on August 11, 1927. Eggs were laid and fertilized then in a battery jar on the laboratory table. The eggs, perhaps 12 hours after fertilization, were spherical and 3.7 to 3.9 mm. in diameter. Some, but by no means all, bore a very slight tuft of adhesive filaments which varied in thickness from 0.15 to 0.30 mm. The eggs do not adhere to glass, but will stick to fragments of algae or to one another by the entangling or adhesion of holdfasts. The embryos are colorless, the yolk opaque and grayish. The yolk sacs of most of the advanced embryos contained a single oil globule about 0.11 mm. in diameter, but in earlier stages of development they had any number up to a dozen or so, of which the largest measured about 0.45 mm.

W. H. L.

The collection contains 2 small specimens, in addition to 7 others, not in good condition, evidently picked up at the bird rookery, as shown by the pieces of broken mollusk shells adhering to them.

Brazil, West Indies, and Florida.

S. F. H.

***Bollmannia boqueronensis* Evermann and Marsh**

In waste from the Bird Key and Long Key tern rookeries were 3 specimens, 65 to 75 mm. long, in very good condition. Two other specimens were removed from the stomach of a *Trachinocephalus myops*, caught in 10 fathoms east of Loggerhead Key.

Tortugas specimens have D. VII-I, $12\frac{1}{2}$; A. I, 12 to $12\frac{1}{2}$. The dorsal spines are a little higher in the male, the 5th, in the male, when depressed extending to base of 4th ray of second dorsal; in the female, to about the 2d; soft fin extending to base of caudal in both sexes; scales in linear series 27 or 28; horizontal rows eight, counting up and forward from the vent; cheek and opercle scaly; about nine rows of scales before dorsal.

Ground color very light; head striped diffusely with a median and two other dusky lines on side, the upper of the two just above eye, continuing on trunk, the lower, as a series of four or five spots, extending to base of the long, pointed caudal. Through the transparent flesh one may see an internal pattern, not made out in detail. The dorsal fins are streaked with narrow parallel lines of sulphur yellow, of which the course of the basal two is modified slightly to form a semi-ocellus on the 3 webs behind the 5th spine in the male, and less conspicuously behind the 6th in the female.

W. H. L.

Seven specimens are included in the collection. Little remains of the color described, other than the "sulphur yellow lines," now white, and the black spot on the spinous dorsal in 5 of these fish. Two others, presumably the ones removed from the stomach of a lizard fish, retain suggestions of five dark spots in longitudinal series along side.

Known heretofore only from Puerto Rico from 8.5 fathoms.

S. F. H.

Coryphopterus glaucofraenum Gill¹

(Plate 29, figure 2)

Coryphopterus glaucofraenum Gill, Proc. Acad. Nat. Sci. Philadelphia, vol. 15, 1863, p. 263 —coast of Washington (by error, unless late students are at fault in associating with this the West Indian species to which names below refer).

Ctenogobius tortugae Jordan, Bull. U. S. Fish Comm., vol. 22, 1902 (1904), p. 541, pl. 1, fig. 1—Tortugas, Florida. Koumans, Prelim. rev. gobioid fishes, 1931, p. 89.

Gobius translucens Nichols, Bull. Amer. Mus. Nat. Hist., vol. 34, 1915, p. 145, fig. 2—San Juan, Puerto Rico.

Common everywhere on bare bottom surrounding the coral stacks. Habitually ascends the eroded faces of the larger Orbicellas. On the bank east of Bird Key harbor the young were very common on small sand patches thrown up among dead coral fragments by burrowing invertebrates. Farther east on a bare slope similarly littered with dead coral there was a specimen to the square foot over a large tract. A single example, somewhat reddish, was dredged in 40 fathoms south of Loggerhead Key.

Its freckling and adaptive changes in shade assimilate this fish to its usual background. The pattern is divisible into surface and internal parts. In the superficial pattern, one or two pairs of irregular streaks run from tip of snout to eye; dorsal surface of conjunctiva figured with black or brown and lustrous white; a pattern of dots and stripes of brown or brassy yellow, with lines and points of silver, extending on head and body; nuchal crest with three, and back with eight or nine other faint dark spots; a pair or a vertical dash at base of caudal; side of nape with dusky penciling; a distinct stripe behind eye with a broken bluish line below running through a darker nucleus above opercular border and continued on body as a series of yellower flecks; a dusky streak, with a concurrent light one below, extending from a dark point at angle of mouth, tangent to orbit, and to pectoral base, represented behind the fin by spots; a third dark line lower on cheek; and a spangling of blue on trunk.

In the internal pattern, strong lines from the eyes pass back but little above the brain, for the broad submedian streaks of pigment are seen through skin, flesh,

¹ Dr. Longley was in doubt as to the proper genus for this species, as is shown by the following note attached to his manuscript: "*Rhinogobius glaucofraenum* until a better name is discovered." He also had a marginal note, "Look up Beebe and Tee-Van." These authors (*Zoologica*, vol. 13, 1932, p. 153) placed this species in the genus *Lophogobius*. Furthermore, they reduced Parr's (*Bull. Bingham Oceanog. Coll.*, vol. 3, art. 4, 1930, p. 122) *Lophogobius pallidus* to the synonymy of *L. glaucofraenum*, a matter Dr. Longley also considered, as is shown by another marginal note. In a recent paper (*A. Hancock Pacific Exped.*, vol. 2, no. 7, 1938, p. 113) Ginsburg placed this species in the genus *Coryphopterus*.—S. F. H.

and cranial bones as they lie on the meninges. Posterior to the brain the two pass toward the median plane, where they run as a single line, rising slowly from vertebral level toward end of base of second dorsal. A short median and two very distinct lateral meningeal lines are present. The latter are mediad to the strong postocular stripes of the superficial pattern. A dark line on the peritoneum continues beneath the vertebral column and into the caudal peduncle. Three vertical bars of dark pigment in the trunk unite the median ventral and dorsal stripes.

Surface and internal patterns register perfectly. Both are subject to change in shade with the shade of the fish's surroundings. The surface pattern on trunk and tail is often much fainter than the internal one: Both are highly effective in assimilating the species to the sandy bottom it haunts.

The eggs were collected on July 7 and 8, 1927. One deposit was beneath dead coral on a sloping bank cutting off a small section from the upper deep hole within Bird Key reef; the other similarly placed in one of the deeper holes in the northern part of Loggerhead shoal. Clean white sand, freshly excavated and scattered over a dark surface, betrayed the site of the first nest discovered, as did the large goby slipping under cover as it was approached. Other similar nesting places were seen later in preparation, with the fish carrying away sand in its mouth and casting it aside.

The egg mass of one nest looked like a smear of thick, rather translucent paste. It was 50 mm. in diameter, and on the under side of a stone measuring 200 by 300 mm. Each egg was contained in a very delicate envelope measuring 0.95 by 0.42 mm., rounded distally, where the egg proper lies, and pointed at the attached pole. The degree of difference in shape at the two ends varies from nest to nest, in part with the stage of development.

The guardian of the eggs in each of the observed instances was a male, readily distinguished by its long urogenital papilla, sharply contrasting with the short broad one of the female, as is usual among gobies. The instinct of one of these fish to protect the eggs in his keeping is strong, as was shown by repeated attacks on a marauding swarm of *Halichoeres bivittatus*. W. H. L.

The collection contains 16 specimens, 22 to 53 mm. long. The raised membranous fold on the median line of the nape, which has been considered of generic importance by some recent authors, is present in all these specimens, including the smallest one.

West Indies to Florida.

S. F. H.

Microgobius Poey

Microgobius Poey, Enumeratio, 1875, p. 126 (*M. signatus* Poey).

Xenogobius Metzelaar, Trop. atl. Vissch., 1919, p. 140 (*X. weberi* Metzelaar).

In his description of *Xenogobius weberi* Metzelaar stated that the head is naked, and it doubtless is so in spite of the fact that his artist has shown it rather well covered with scales. Text and illustration together indicate clearly a species of *Microgobius*, for the presence of a patch of ctenoid scales behind the pectoral fin is no distinctive mark. It occurs in the species recently described, which is

closely related to *Microgobius signatus*; and with *M. signatus* *Xenogobius weberi* seems identical.¹

W. H. L.

Microgobius microlepis Longley and Hildebrand

Microgobius microlepis Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 257, fig. 17—Tortugas, Florida.

Family ECHENEIDAE. REMORAS

Echeneis naucrates Linnaeus

Locally more common than *Remora remora*. It accompanies sharks and jewfishes, and it also has been seen clinging to *Sparisoma distinctum* and *S. viride*, to *Caranx ruber*, and to *Diplodus holbrooki*, whose length may be no more than twice its own. To some of these smaller "hosts" it seems an annoyance of which they may attempt to rid themselves by rubbing their sides against the bottom. But without losing its hold the sucking fish evades the danger by simply shifting its position as the host's body turns downward. Even when it leaves the host it appears to have no difficulty in returning to it.

Greenish above and below; side with a white-margined dark brown stripe running from tip of lower jaw through eye to base of caudal fin, on which it expands to cover the greater part of its surface; ocular parts of this stripe continued on anterior and posterior surfaces of eye not exposed in rest; origins of dorsal and anal fins practically opposite each other, the fins of nearly the same size and shape. When this remora clings to its host by its sucking disk it holds its ventral fins closely apposed to each other and to its body, where they form a median dark patch against the lighter background. These peculiarities make it appear as if its ventral side were uppermost, when the reverse is true. When the fish swims the case is aggravated because in the virtual absence of countershading the ventral side may seem nearly black, although it is actually no darker than the dorsal surface.

All warm seas, northward to Massachusetts.

W. H. L.

Remora remora (Linnaeus)

Only 2 individuals were taken. These were secured with 2 specimens of *Echeneis naucrates*, all removed from an 11-foot tiger shark.

All warm seas, northward to Massachusetts.

W. H. L.

Family CALLIONYMIDAE

Callionymus agassizii Goode and Bean

One of the commonest of bottom fishes south of Tortugas at depths of 80 to 100 fathoms, where the largest specimen taken was 220 mm. long. It spawns in the middle of July.

¹ Although Dr. Longley did not say so, he examined the type of *Xenogobius weberi* in Amsterdam, and made several notes.—S. F. H.

D. IV-8½; A. 7½. Translucent; ground color faintly rosy and finely mottled with much yellow; sides of head in male with conspicuous spots and irregular streaks; lower part of side with several longitudinal streaks tending to unite irregularly; fins rosy; the second dorsal much spotted in broken oblique lines across the rays; anal broadly orange-margined; caudal with longitudinal streaks of yellow between rays. Female apparently smaller than male, with less elaborate pattern of yellow markings and less developed filaments on first dorsal and caudal.

The several stomachs examined contained small crustaceans, including larval forms, and a number of small scaphopod shells. W. H. L.

The collection contains 12 specimens, 39 to 155 mm. long to base of caudal. The total length cannot be given because the middle rays of the caudal, which are greatly produced in adults, are broken in some specimens.

The preserved specimens now are uniformly pale, except for a dark spot on the membrane between 3d and 4th spines of first dorsal and a definite black submarginal band on anal in specimens under 75 mm. in length to base of caudal. These markings are indefinite in 2 specimens, 100 and 105 mm. long without the caudal fin, and are entirely missing in the 2 largest ones, 127 and 155 mm. long to base of caudal.

West Indies to Florida.

S. F. H.

Callionymus bairdi Jordan

One specimen, a male, 68 mm. long, from the 10-fathom channel east of Loggerhead bank.

D. IV-9½; A. 8½. Preopercular spine with 1 antrorse point on its outer or lower margin, and 6 recurved teeth on its upper or inner margin.

The color pattern is an exceedingly intricate one with a general ruddy cast, except that the belly is white. The pattern consists principally of dorsal dark saddles on a light ground, both being much mottled; the rule holding throughout that dark areas are darkest, light areas lightest, toward the periphery; first dorsal dusky and notably spotted with gray and yellow, except from 1st to 2d spine on left side; the narrow unspotted part forming entire exposed surface in the folded fin, its color and pattern blending intimately with those of back; second dorsal finely mottled like the back; ventrals similarly marked, but darker; pectorals transparent with transverse rows of red dots; anal dusky toward margin; caudal banded.

In fin formulas, and to a certain extent in color, this fish agrees with the type, which despite its state of partial digestion is still much speckled with red. Within the probable limits of individual variation it agrees with the type, too, in the form of the preopercular spine, though in the type specimen the teeth on the superior or posterior border are 8 instead of 6 in number, and the spine itself on one side ends in an additional sharp point.

Gulf of Mexico, off coast of Florida.

W. H. L.

Callionymus boekei Metzelaar

Callionymus boekei Metzelaar, Trop. atl. Vissch., 1919, p. 149, fig. 46—Curaçao.

Callionymus sancti eustatii Metzelaar, *ibid.*, p. 150, fig. 47—St. Eustatius.

Seined not infrequently on the flats inside Bird Key reef. It is accustomed to life on sandy bottom, in which it embeds itself with a rocking movement. The reduction of its gill openings to narrow foramina on the dorsal side is consistent with this habit. It may "creep" slowly over the bottom on its ventral fins, the tips of which are strongly exerted.

D. IV-9½; A. 8½; P. 19; V. 1,5; C. 13, the upper 3 and lower 2 simple, none produced. Head barely more than 3.0 in standard length; depth 5.5; anal base 3.2. Least depth of caudal peduncle 1.2 in eye, all measured in a male 78 mm. in total length. The preopercular spine with 3 strong antrorse barbs on upper or inner side, the inclination increasing progressively from behind forward, with a single barb on lower or outer side.

Both sexes changeable in shade; the female, in the grayer phases, especially irregularly mottled and marbled with light spots on a darker ground, the light areas lightest at their borders, the dark areas darkest where in contact with light ones. The variegated grayish ground color in the male interrupted more definitely by four crossbars of olive, narrower than the interspaces, the first under spinous dorsal, two under soft dorsal, and one on caudal peduncle; sides olive, with a horizontal row of white spots below; seven parallel bars of olive on throat and branchiostegal membranes; spots of blue (lacking in the female) on cheeks and side of body above base of pectoral, shimmering with the iridescent luster of labradorite; spinous dorsal of the most brightly colored male rather yellow on left side, with a submarginal band of pale yellow and black; the ground color spotted with lavender with dark lines between rays, right side similar, except for 1st and 2d spines and the web between, where the color was broadly diffused with the dorsal gray, the only part of the fin's surface showing when depressed (female without the bright hues on first dorsal); second dorsal with four brown lines extending down and back at right angles to the rays; pectorals transparent with vertical dark lines formed by rows of spots on the rays; ventrals and anal much more heavily pigmented in the male.

Only sexual differences distinguish Metzelaar's two nominal species. The type of *Callionymus boekei* is a male, that of *C. sancti eustatii* a female. W. H. L.

The collection contains 13 specimens, ranging in length from 58 to 65 mm. Evidently this is a much smaller species than *C. agassizii*. The caudal fin is convex and without produced rays. The first dorsal is much higher in the male than in the female, but the spines, unlike those of *C. agassizii*, bear no filaments.

The females have not changed greatly in pattern in preservatives, except that the yellow and green have faded. The males, too, have retained the markings rather well, with some of the blue remaining. The general color of the male is now grayish, variously speckled on upper parts of head and body; lower parts of head from posterior angle of mouth to base of pectoral with vertically elongate

brown spots; sides of head, including side of snout, with bluish dots, extending backward on ventrals, and tending to form cross streaks on upper part of the broad membranous base; ground color of ventral itself brownish; anal brownish, with small blue spots; pectoral pale gray, with dark crossbars; first dorsal largely dusky, with a broad white margin; second dorsal and caudal mostly grayish with darker markings tending to form crossbands, most noticeable when the fins are folded.

Dutch West Indies to Florida.

S. F. H.

Family PTEROPSARIDAE

Bembrops Steindachner

Bembrops Steindachner, Sitzungsber. Akad. Wiss. Wien, vol. 74, 1876, p. 163 (*B. caudimacula* Steindachner).

Hypsicometes Goode, Proc. U. S. Nat. Mus., vol. 3, 1880, p. 347 (*H. gobioides* Goode).

Bathypercis Alcock, Jour. Asiatic Soc. Bengal, vol. 62, pt. 2, 1893, p. 177 (*Bathypercis platyrhynchus* Alcock = *Bembrops caudimacula* Steindachner).

Alcock appears to have been first to recognize the identity of the genera *Hypsicometes* and *Bembrops*. His reduction, however, of the Atlantic species to synonymy under *B. caudimacula* Steindachner cannot be maintained, though his identification of the Indian species with the Japanese species seems entirely justified.

W. H. L.

Bembrops gobioides (Goode)

Common south of Tortugas, between depths of 100 and a little more than 200 fathoms, only 1 specimen having been secured in shallower water.

This species usually has D. VI-17½; A. 18½. The type is no exception, although originally described as having only 16 anal rays. At a length of 46 mm. to base of caudal, it was still a rather delicate specimen, and it has lost many scales. Examination of other specimens now available shows that the scale formula usually is 4-65-6. *Bembrops caudimacula*, by comparison, usually has 14½ dorsal and 15½ anal rays, and 50 scales in the lateral line, according to the original descriptions and 3 specimens (U. S. Nat. Mus. no. 59647), from Kagoshima, Japan. The two also differ decidedly in proportions. The head, measured to the end of the opercular flap, in a specimen of *B. gobioides* 170 mm. standard length is 52 mm. (2.8), the long diameter of the eye 14 mm. (3.7 in head). In one of the Japanese specimens, the corresponding measurements are: Total length 134 mm., standard length 109 mm., length of head 44 mm. (2.5), long diameter of eye 10 mm. (4.4 in head).

Seven in a lot of 73, taken in 205 to 221 fathoms, had recognizable food in their stomachs. In 6 of the 7, the food consisted of a specimen or specimens of *Chlorophthalmus chalybeius*, which according to this and other records seems to fall prey to *Bembrops* very frequently.

From rather deep water in the Gulf Stream from Tortugas, Florida, northward.

W. H. L.

Family OPISTHOGNATHIDAE. JAWFISHES

As a convenience to those using this monograph, a key to the genera and species is offered, which seems especially desirable, as two previously unknown species have recently been described.

S. F. H.

KEY TO THE GENERA AND SPECIES

- a.* Dorsal spines flexible; cheeks and opercles naked; caudal rounded or at most only slightly pointed; gill rakers 35 or fewer on lower limb of first arch *Opisthognathus*
- b.* Dorsal and anal fins short, the former with XI,₁₂ and the latter with III,₁₂ rays; body plain olivaceous in life, light brown in preservative *lonchurus*
- bb.* Dorsal and anal fins longer, with more than 23 spines and divided rays in the dorsal, and more than a total of 15 in the anal
 - c.* Caudal fin broadly rounded; gill rakers 23 or fewer on lower limb of first arch; body and dorsal fin variously spotted with dark or black blotches; two pale spots on base of caudal fin, one above and one below middle line
 - d.* Maxillary with a supplemental bone; eye very large, about 2.5 in head; dark blotches on back not extending on base of dorsal fin; dorsal with a black spot high up on fin, between spines 7 and 9 or 10 *fasciatum*
 - dd.* Maxillary without a separate supplemental bone; eye smaller, 3 or more in head
 - e.* Scales small, about 90 to 100 in lateral series; dark blotches on back and along middle of side large, those on back extending distinctly on base of dorsal fin; a prominent black spot near base on dorsal between spines 6 and 9 or 10 *maxillosus*
 - ee.* Scales larger, about 55 in lateral series; blotches on body smaller and less distinct; a prominent dark spot on dorsal between spines 2 and 4 or 5 *whitehurstii*
 - cc.* Caudal sharply rounded to somewhat pointed in adult; gill rakers about 33 on lower limb of first arch; scales very small, about 115 in lateral series; body light brown in preservative, golden brown in life; no spots on body or fins; dorsal, and sometimes anal, with black margins, blue in life *aurifrons*
- aa.* Dorsal spines stiff, pungent; cheeks and opercles scaled; caudal lanceolate; D. XI,₁₆; A. III,₁₆; scales in lateral series about 63; gill rakers about 39 on lower limb of first arch *Lonchopisthus micrognathus*

Opisthognathus Cuvier

Opisthognathus Cuvier, Règne animal, 1st ed., 1817, p. 252 (*O. sonnerati* Cuvier).

Gnathypops Gill, Proc. Acad. Nat. Sci. Philadelphia, vol. 14, 1862, p. 241 (*Opisthognathus maxillosus* Poey).

The relation of species of *Opisthognathus* and *Gnathypops* has been for a long time, and still is, puzzling. Jordan and Evermann (Bull. U. S. Nat. Mus., No. 47,

pt. 3, 1898, p. 2280) called attention to the possibility that "species" of the former may include males only, those of the latter the corresponding females. Meek and Hildebrand (Field Mus. Nat. Hist., Zool. Ser., vol. 15, pt. 3, 1928, p. 900) concluded that *Gnathypops scopis* is indeed the female of *Opisthognathus ommatum*, and their recognition of the single sexually dimorphic species *Opisthognathus scopis* (Jenkins and Evermann) lends strength to the hypothesis. The paucity of material available for study makes it impossible to determine, however, how generally sexual dimorphism occurs. Even the readily accessible material at Tortugas does not answer the question, since no species seem to breed there during the summer.

Still, one observation makes it clear that the difference between the two genera is overemphasized: *Opisthognathus lonchurus* Jordan and Gilbert and *Gnathypops mystacinus* Jordan are surely the same species. For the present, then, though for a somewhat different reason, I join Meek and Hildebrand in regarding *Gnathypops* as a synonym of *Opisthognathus*.

W. H. L.

Opisthognathus lonchurus Jordan and Gilbert

Opisthognathus lonchurus Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 5, 1882 (1883), p. 290—Snapper Banks off Pensacola, Florida.

Gnathypops mystacinus Jordan, Proc. U. S. Nat. Mus., vol. 7, 1884, p. 37—Snapper Banks off Pensacola, Florida.

Of what seems to be this species I have 1 small specimen, taken in 40 to 50 fathoms, south of Tortugas. It is 29 mm. long to caudal base.

Eye very large, before which the profile falls very abruptly, making the snout very short. Head 10 mm.; eye 4.0 mm.; snout 1.0 mm. D. $XI, 12\frac{1}{2}$; A. $III, 12\frac{1}{2}$; P. 19. Scales very small and hard to count, about 85 transverse series between upper angle of gill opening and base of caudal fin, 17 longitudinal series between last rays of dorsal and anal; about 55 pores in lateral line; upper jaw with canines of irregular sizes, in a single row except anteriorly, where in an inner row are 3 or 4 on either side of the symphysis; teeth arranged similarly in lower jaw, except that in the inner row are 6 or 7 on either side of mid-line; 2 teeth on vomer, one much stronger than the other.

In life pale olivaceous above and white below; dorsal fin slightly darker toward the margin, and anal fin with an orange spot between 7th and 9th rays.

Jordan and Gilbert's and Jordan's species, cited above, were based on material recovered in rather poor condition from the stomachs of *Lutianus aya*, caught in deep water. The first is said to have the fin formulas D. 25; A. 15; 67 rows of scales in transverse series; and 5 large teeth on the vomer; the second, D. 23 or 24 (X, 14); A. II, 11; about 54 tubes in lateral line; 100 scales between gill opening and caudal; vomerine teeth 4. It appears, however, from re-examination of type material, that this is not entirely accurate. Type and cotype of *Opisthognathus lonchurus* have D. $XI, 12\frac{1}{2}$; the cotype A. $III, 12$, the type 12 anal rays only, the spines having been lost in the process of digestion. The fin formulas in the type of *Gnathypops mystacinus* are also D. $XI, 12\frac{1}{2}$; A. $III, 12$. Type and cotype of the first have respectively 7 and 3 vomerine teeth; the type of the second

has 5. In *G. mystacinus* the scales in series between gill opening and base of caudal are about 95; scales in lateral line about 59. Although few scales remain on either specimen of *O. lonchurus*, it is possible to recognize about 57 in the lateral line. Beyond its end, counting is difficult, but a total of 88 may be made out. The number of fin rays and scales in lateral line and the total number of transverse series in the two nominal species are, therefore, almost or quite the same. The supplemental bone of the maxillary, which is variable in this family, in these fish is the same in shape and position.

W. H. L.

The Tortugas specimen has faded to a light brown. The fins are paler than the body, and both dorsal and anal are darker toward their margins.

Gulf of Mexico off Florida, in rather deep water.

S. F. H.

***Opisthognathus fasciatus* Longley**

Opisthognathus fasciatus Longley, in Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 259, fig. 18—Tortugas, Florida.

***Opisthognathus maxillosus* Poey**

Although noticed elsewhere, this fish is most commonly, though always sparsely, distributed over the Loggerhead reef, where it lives in burrows. Its burrows most abound about coral stacks just beyond the *Thalassia* zone. Those of the largest fish are about 40 mm. in diameter and may be more than 300 mm. deep, and terminate below in a chamber having the capacity of a pint measure. The vertical shaft is lined with shell and coral fragments, like that of *Opisthognathus aurifrons*. The proportions of shaft and chamber were learned by filling them with plaster of Paris and digging up the casts after the material had set.

The mouth of the burrow of *O. maxillosus* is sometimes surrounded by pieces of dead coral, heaped up in the form of a low cone. Within this rampart the fish then "stands" vertically with little more than snout exposed, keeping a watchful eye on all that comes near. It interrupts its vigil occasionally by trips to the depths, from which it may return with a mouthful of sand to be cast out. Few were found engaged in constructing burrows. Renovation was promptly made, however, when sand was poured into their quarters. At intervals the watch ceases, and a period of complete seclusion begins. At such times the entrance to the shelter usually is closed by the retiring fish drawing in from without a piece of coral that sticks fast.

Sometimes slabs of coral through which the mussel *Lithophagus* has bored its way, or other openings, give the fish access to spaces beneath. In one instance several fish had discovered a flat expanse and had occupied ready-made chambers that needed only to be cleared out. They surrounded their doorways, however, with circles of *Acropora* fragments.

It is fortunate that the original description of this species serves to identify it, since the type is apparently lost. At Tortugas we have had many specimens 48 to 145 mm. long.

In a series of 8 specimens all had D. XI,16; A. III,15 in 1, II,16 in 3, and III,16

in 4, the 1st spine sometimes being so small that dissection was necessary to discover it; P. 20 in 3 fish; head naked; scales 95 to 100, pores of lateral-line system irregularly distributed, anteriorly in a broad band whose borders converge posteriorly; teeth rather strong, wide-set, in two series, the inner limited to a few in front directed backward, particularly in the upper jaw; a single large vomerine tooth; maxillary without supplemental bone, truncate posteriorly, extending beyond eye for a distance equal to diameter of orbit; gill rakers long, slender, compressed, 11 above and 19 below angle of first arch.

This species is very changeable in shade. Fish which have been for some time in the depths of their burrows are often so dark when they first come up that the dark ocular bar usually shown fails to stand out in contrast with the light ground color. The basic pattern is the same as in *O. whitehurstii*. On the lighter ground color appear ocular, postorbital, and occipital bars, dark patches in exactly the same number in the two under the base of the dorsal, and a lateral stripe, which in this species shows little tendency to resolve itself clearly into a series of spots. In *maxillosus* there is, however, a marbling superimposed alike on the olivaceous ground color and the darker bars. The dark tracery of this pattern is finest over head and nape, and along base of dorsal nearly to end of spinous part. On the sides the design changes and the marbling is replaced, particularly throughout the dark lateral stripe, by irregular light spotting. Occipital bar double; dark spots, in series along back, extending on base of dorsal, the upper end of that one falling between 6th and 9th or 10th spines semiocellated in the smaller fish, unocellated in larger ones; dark spots on the rays varying in distinctness; ventrals dark, spotted with lighter color; both dorsal and anal more heavily pigmented than in *O. fasciatum*, with several series of white spots on anal and more numerous rows of white spots on dorsal than in that species; caudal olive with dark bars and two conspicuous light spots at base; floor of the mouth dusky; tip of the jaw white; a dark spot on either side connected by a broad black band extending far up the inner face of operculum; a black ring about opening of esophagus.

The infection of this species by a trematode is common and severe. The air bladders of none of the fishes examined were found to be free of cysts, which in one instance numbered 53.

W. H. L.

The collection contains 14 specimens, 44 to 145 mm. long. According to Dr. Longley's records, this species grows larger than the others represented locally. This species resembles *O. fasciatum*. The proportions do not differ greatly except in the size of the eye, the eye in the present species being notably smaller, a difference readily seen if specimens of about the same size are compared. The scales apparently are a little larger and the gill rakers possibly slightly less numerous. The following proportions and enumerations are based on a specimen 66 mm. long: Head, measured to tip of opercular spine, 3.0; depth 4.3. Eye in head 3.25; snout 8.75; interorbital about 17.5; maxillary 1.45; caudal peduncle 3.2; ventral 1.5; pectoral 1.75. D. XI, 15; A. III, 15; P. 19; scales about 90; gill rakers 19.

The preserved specimens, now as in life, are very similar in color to *O.*

fasciatum. The dark spots on the back, however, definitely extend on the base of the dorsal fin, and the one between the 6th and 9th spines is much nearer the base, larger, and more prominent. The dorsal and anal, especially in large examples, are more profusely spotted with white and dusky, the light longitudinal bands on the dorsal are less distinct, and the caudal has distinct dark bars, except in the smallest specimens, wherein it is plain.

West Indies to Florida.

S. F. H.

***Opisthognathus whitehurstii* (Longley)**

Gnathypops maxillosa Jordan and Evermann (not of Poey), Bull. U. S. Nat. Mus., No. 47, pt. 3, 1898, p. 2284, fig. 801.

Gnathypops whitehurstii Longley, Carnegie Inst. Wash. Year Book No. 30, 1931, p. 385—Tortugas, Florida (notes, but no description).

Opisthognathus whitehurstii Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 262, fig. 19.

***Opisthognathus aurifrons* (Jordan and Thompson)**

(Plate 30, figure 1)

Tortugas is the type locality for this species, and for more than 20 years it was known only from the type specimen. Yet it is rather common. It is a burrower, however, and has a ready mode of escape from the seine or dredge. As a burrower, too, its local distribution is determined largely by the nature of the bottom, and as this often meets its requirements only in small areas it is comparatively easy to overlook it entirely. Found in small numbers over the flats between Long, Bush, and Bird keys, and in larger numbers on the gravelly patches between the shore and reef on the west side of Loggerhead Key, and on similar patches west of the grass belt farther up the reef; on the sandy bottom of a deep hole in the Loggerhead reef there were 18 in sight at once, and in another hole, 27.

The burrows are perhaps 300 to 350 mm. deep. They are enlarged below, the shape of the terminal chamber being fixed largely by the arrangement of the larger bits of dead coral by which it is surrounded. Rarely a fish was found engaged in building its retreat. In one instance one had been at work for some time in the bottom of a depression, where it had made a shaft whose depth was greater than the length of its own body. While being watched, again and again it went out several times its own length and brought back in its mouth bits of shell or dead coral. On its return it entered the burrow tail foremost until its mouth was nearly level with the rim, whereupon it laid its burden down, or shifted it until it seemed to rest snugly in place. Sometimes a piece with algae attached was rejected. The carrying of "stone" was interrupted from time to time by trips to the bottom of the burrow for sand, or sand was brought in the mouth from outside. The sand was deposited outside and against the rising wall until the construction was brought to the level of the surrounding bottom. Finally the burrow was vertical, in diameter a little greater than the builder's body, and "stone-lined," except in its terminal chamber. Even there it was stone-lined, though naturally. The finished work represents a considerable expenditure of labor, and it appears to be occupied for an indefinite period. Some effort is necessary, however, to keep

the home in repair, and often a ring of white sand about the threshold indicated that such work had been done.

When resting, the fish may sometimes be seen "sitting" in the mouth of its burrow. If there has been no cause for alarm, its ventral fins may be at the level of the opening and its whole head exposed. Otherwise it may "sit" lower, with only the snout and eyes exposed. More commonly the fish "float" a foot or more above their retreats, but on the approach of danger they settle down tail first, and in emergency they dart in head foremost. If one fish's shelter is destroyed it usually seeks refuge with another, but such intrusion appears to be unwelcome, and two were rarely seen living amicably together.

The fish when "floating" feed on drifting plankton. Their food is greatly varied. In the fraction of a cubic centimeter of material taken from the gut of one specimen, W. L. Schmitt recognized the tail of a shrimp zoea, a small hermit crab, two barnacle larvae, several ostracods, a tanaid isopod, an amphipod, a dozen copepods representing several species, and several recently hatched snails.

Of 12 fish examined, 5 were without and 7 contained a total of 16 metacercariae encysted in the air bladder. H. W. Manter found that these apparently were *Stephanostomum sentum*, which also occurs, but less abundantly, in the air bladder of the other Tortugas species of *Opisthognathus*.

This golden-brown fish is marked with a yellow wash across the front and nape to base of dorsal, along which it continues for half the length of fin; body and fins faintly bluish except as already noted; a blue line between lateral line and dorsal fin; a dark stripe of pupillary width through eye; iris below this line blue, then yellow, and yellow above it.

W. H. L.

The collection contains 22 specimens, 37 to 90 mm. long. The caudal fin is described and figured as truncate in the original description, whereas it is decidedly rounded to somewhat pointed in the specimens at hand.

The fish have faded in preservative to rather light brown, with the ventral surface of the head and abdomen pale. The "blue line" between lateral line and base of dorsal has turned pale in preservative, and is a scaleless strip; dorsal, caudal, and anal fins pale gray, with a bluish to dusky margin on dorsal and anal, most prominent on dorsal; pectorals plain translucent; ventrals white.

It is difficult to distinguish between divided and undivided rays in the dorsal and anal, because they are enveloped in rather thick skin. For that reason, no doubt, the counts of the fin rays were given in the original description (Jordan and Thompson, Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 252, fig. 4) without making a distinction, the counts being D. 26; A. 18; P. 18. Two of the specimens at hand have, respectively, D. 26, 26; A. 17, 18; P. 18, 18; gill rakers 33. The scales are too small to enumerate accurately, probably about 115.

Known only from Tortugas, Florida.

S. F. H.

Lonchopisthus micrognathus (Poey)

This species is rare indeed in collections. It is only moderately rare in the catch of the terns of the Bird Key rookery. It was first found among scraps picked up

dried and sun-baked from the ground, where the parent birds had dropped them in feeding the young. Later a sick or injured specimen was found floating at the surface in the channel between Loggerhead Key and White Shoal. This observation places this fish among the species occurring within the lagoon, for it seems impossible that this crippled fish had escaped the notice of predaceous fishes and birds long enough to drift far. It probably is another burrowing species.

Poey (Memorias, vol. 2, 1860, p. 287) described it very well. In all specimens examined, however, the dorsal spines are 11, the anal spines 3, instead of 10 and 2 as usually recorded, the usual formulas being D. XI,16; A. III,16. The body is crossed by many pale blue rather than white lines.

West Indies to Florida.

W. H. L.

Family URANOSCOPIDAE. STARGAZERS

The principal differential characters of the three genera represented in the local fauna are stated in the following key.

S. F. H.

KEY TO THE GENERA

- a.* Scales on most of body; free margins of dentary bones forming two prominent parallel bony ridges on anterior part of lower jaw; no prominent expansions or spines on preopercle or subopercle . . . *Benthoscopus*
- aa.* Scales wanting; chin without prominent bony ridges
 - b.* Head very large and bony, about 2.2 in length; angle of preopercle developed as a long, flattened winglike appendage, equal to about a third the length of head *Excectides*
 - bb.* Head much smaller, about 3.0 in length; angle of preopercle without a prominent appendage; subopercle with spines . . . *Kathetostoma*

Benthoscopus Longley and Hildebrand

Benthoscopus Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 264.

Benthoscopus laticeps Longley and Hildebrand

Benthoscopus laticeps Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 264, figs. 20, 21—Tortugas, Florida.

Excectides egegius Jordan and Thompson

This species apparently was not seen by Dr. Longley, and remains known only from the type, taken at Garden Key a long time ago.

A description with two figures was offered by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 253, figs. 5, 6). Its very large, roughly sculptured head, contained only 2.15 times in standard length, and the long, flattened, winglike appendage at preopercular angle distinguish it from other local forms. Some other proportions and enumerations given in the original description are: Depth 3.3; Eye in head 4.3; snout 5.3; maxillary 2.3; pectoral 1.8; ventral 3.0. D. 12; A. 17; P. 22; V. 15. The color was described as blackish, with dark points; fins pale, with a blackish area at base of each; a pale streak along lateral line, and one across base of dorsal.

Known only from Tortugas, Florida.

S. F. H.

***Kathetostoma albigutta* Bean**

Twelve specimens, 100 to 160 mm. long, were taken in 67 to 88 fathoms.

In 3 specimens the counts are D. 14 or 14½; A. 12 or 12½; P. 15 or 16, the uppermost ray and the lowest one or two simple; lateral line converging sharply upward toward dorsal and then concurrent with the dorsal base, turning downward sharply there toward middle line of caudal peduncle; opercular margin slightly fringed along its upper part.

The very pale brown ground color is darkest immediately next to the borders of the white spots on back and sides; dark spots on caudal variable in number, but usually less than nine.

W. H. L.

The collection contains 4 specimens 108 to 135 mm. long. The general color in preservative is grayish brown above; white underneath; numerous small white spots, outlined with brown rings, between the bony rim of armature of head and origin of dorsal; the white spots becoming much larger, and some of them decidedly elongate, posterior to origin of dorsal; dorsal fin pale, with two or three large black spots; caudal pale, with five to eight similar black spots; anal pale, sometimes with a dusky spot on base of last rays; ventrals pale; pectorals pale at base, then dusky, margin white.

Subopercle with 5 recurved spines; humeral spine very long and strong; lower jaw fringed; scales entirely wanting.

The following proportions are based on 2 specimens, each 135 mm. long: Head (measured to margin of upper jaw) 2.9, 3.15; depth 3.9, 4.0; anal base 2.8, 2.9; dorsal base 2.9, 3.0; pectoral 3.0, 3.2; ventral 4.3, 4.5. Eye in head 6.3, 6.9; snout (to margin of upper jaw) 9.2, 9.4; interorbital 4.2, 5.0; maxillary 2.1, 2.1.

Gulf of Mexico, in rather deep water.

S. F. H.

Family DACTYLOSCOPIDAE. SAND STARGAZERS***Girella semicinctus* Gilbert**

Seined occasionally on Long Key and Bird Key flats; also taken once in 4 fathoms on the bank of White Shoal. A very delicate form, usually surviving capture only a short time.

A fish of sandy bottom, bedding itself at once in sand in an aquarium, the bedding being accomplished by swimming motions of the pectorals aided by the undulation of the trunk, and particularly by that of the long anal fin, which may be flexed so strongly as to pick up sand grains. It may bury itself till only the eyes or even only one eye protrudes. There are cirri on the lower lip, and dermal processes at the upper margin of the branchial clefts guarding the mouth and gill openings.

On a lighter ground are dark dorsal saddles in two series alternating with each other and separated by wider interspaces of the ground color, one series extending farther down on the sides than the other. Neither within the dark dorsal patches nor in the ground color is the pigmentation uniform, both, especially the ground color, being mottled.

There is a single rounded supraocular cirrus, and a row of eight papillae,

simulating coral grains, with shadow between them at the outer margin of the conjunctiva below. Dusky areas extend from either nostril to the margin of the premaxillary border, and are matched across the mouth opening by dark dots on the dentary.

W. H. L.

The collection contains 6 specimens, 38 to 70 mm. long. Only 1 of these retains dusky saddles. Two specimens have pale spots on a gray background, which are missing in the others. In 3 specimens the fin formulas are: D. III-35, IV-40, V-34; A. 32, 34, 34. Scales 47, 48, 49.

Reported from the Gulf of California and from Florida.

S. F. H.

Gillellus rubrocinctus Longley

Gillellus rubrocinctus Longley, Carnegie Inst. Wash. Year Book No. 33, 1934, p. 257—
Tortugas, Florida. Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 267, fig. 22.

Family BLENNIIDAE. BLENNIES

In their *Check list* (1930) Jordan, Evermann, and Clark, accepting and elaborating a suggestion of long standing by Gill, redistributed the North American Blenniidae in eleven small families. The species to which the proposed change applies appear under 141 names, of which 68 refer to sorts supposedly occurring between Bermuda and the Carolinas and Brazil. But at least 26 of these 68 names are pure synonyms. One species is enrolled five times, and several three times. Several species are entered in two genera, and one in three genera, allocated to two of the proposed families. The conservative position is adopted here, that until the group is more closely studied it is best to move slowly with its subdivision.¹

W. H. L.

Enneapterygius Rüppell

Enneapterygius Rüppell, Neue Wirbelthiere, Fische, 1835, p. 2 (*E. pusillus* Rüppell).

Enneanectes Jordan, Proc. Calif. Acad. Sci., ser. 2, vol. 5, 1895, p. 501 (*Tripterygium carminale* Jordan and Gilbert).

Gillias Evermann and Marsh, Rept. U. S. Fish Comm., pt. 25, 1899 (1900), p. 357 (*G. jordani* Evermann and Marsh).

Enneapterygius jordani (Evermann and Marsh)

Not uncommon in the shadows under overhanging margins of eroded *Orbicella* heads. By fits and starts the fish creep about there, often back downward. I have never seen one, but sometimes two in each other's presence, "standing" on pectorals and ventrals and waving their trunks freely.

This species is highly changeable in coloration and readily adaptable to the background. It is readily distinguishable by the dark band about the caudal peduncle.

A specimen 38 mm. long is like the type from Puerto Rico except that it has

¹ Dr. Longley found it necessary to study blennies not taken at Tortugas, in order to identify the local forms properly. He prepared accounts of several species not found at Tortugas, which are included here, as they are valuable in showing relationships. Much work evidently was required, as the data on which the accounts are based were gathered in various museums in Europe and America.—S. F. H.

D. III-XII-9; A. II,18; P. 16; Evermann and Marsh (Rept. U. S. Fish Comm., pt. 25, 1899 (1900), p. 357, original description) gave D. III-XII-7; A. II,15. The Tortugas specimen has the breast and belly fully scaled, whereas the Puerto Rican one was described as having these regions scaleless. W. H. L.

The collection contains 3 specimens, respectively 34, 36, and 36 mm. long. The following proportions are based on 2 of these specimens and the enumerations on 3: Head 3.5, 3.6; depth 5.6, 5.7. Eye in head 3.6, 3.8; snout 3.5, 3.8; maxillary 2.3, 2.5; pectoral 0.9, 0.9. D. III-XI-8, III-XII-8, III-XI-8; A. II,16, II,16, II,15; P. 15, 15, 15; scales 31, 32, 32.

West Indies to Florida.

S. F. H.

Malacoctenus macropus (Poey)

Myxodes macropus Poey, Repertorio, vol. 2, 1868, p. 399—Havana.

Malacoctenus moorei Evermann and Marsh, Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 309, fig. 97—Culebra Island, Puerto Rico.

Common about margins of sandy-bottomed holes in turtle grass, very common on the outer edge of Bird Key reef and generally over bottom covered with dead coral fragments. It creeps sometimes over the surface of living *Orbicella* heads.

In the Museum of Comparative Zoölogy (no. 12511) are 2 specimens of this species sent by Poey. The larger fish is of the same length as his type (35 mm.), which we may take it to be. Except for a spine less and a ray more in the anal, the fin formulas (D. XXI,10; A. II,19) are correctly given. This fish agrees further with Poey's description in having the 1st dorsal spine stronger than those immediately behind it. It has teeth on the vomer, none on the palatines. By oversight it was said to lack filiform appendages on the head and nape. The smaller of Poey's 2 specimens is 30 mm. long. Its fin formulas are D. XX,10; A. II,19, an anal ray less than in a sample of 30 from Tortugas, showing a variability of D. XXI to XXII,9 or 10 (1 specimen with XX,10, and another with XXII,8); A. II,20 or 21 (3 specimens with II,19).

The type of *Malacoctenus moorei* is a normal specimen of *Malacoctenus macropus*. Its fin formulas are D. XXI,11; A. II,21. Its first dorsal spine is broken, and is restored incorrectly in Evermann and Marsh's figure, which shows the dorsal spines of one length anteriorly.

Copepods and other minute crustaceans occur in its stomach.

The male is darker and richer in coloration than the female, and it often shows a dark dorsal surface meeting a ventral light one along a rather sharply drawn line running from the snout, tangent to lower margin of orbit, to mid-base of caudal; the dark color is sometimes solid, sometimes interrupted by blotches of white along base of dorsal, and sometimes about six light bands are present. Nape and occiput dark; the cheek, throat, and opercle mottled with red; dorsal dotted with reddish-brown spots on the rays; anal reddish over its basal half.

The female displays no red, and sometimes is merely speckled with dark on light gray, or may show dark and light gray bands like the male, but not the netted pattern of the branchial region. She may be dark above and light below, but lacks the brown of the male, and sometimes has a greenish cast.

By differences in color the sexes may be distinguished at least from the length of 35 mm., and they are externally recognizable also by the differences in structure of the genitalia, as described under *M. versicolor*.

The ovaries of the female are well developed in June, and breeding doubtless proceeds throughout the summer. A "nest" was first discovered through the behavior of the male parent, who guards the eggs. One was observed several times slipping over and under a dead alga-covered gorgonian base. I moved small pieces of dead coral lying near and so drew a swarm of *Halichoeres* to the spot. They were set upon as anticipated. The bit of gorgonian might not be approached without throwing the tiny fish into a fit of excitement. On microscopic examination, clustered eggs, nearly spherical and about 0.8 mm. in diameter, were found entangled in filamentous algae on its under surface. Each egg had a tuft of threads attached to its membrane at either pole, more at one pole than the other, serving to hold them where deposited.

Deposition evidently occurs repeatedly at one spot, since within a circle about 25 mm. in diameter eggs were found in three distinct stages of development. The youngest had a cap of cells at the attached pole, the next showed embryos reaching four-fifths the way round the egg, and the oldest were near hatching.

W. H. L.

The collection contains 52 specimens, 27 to 49 mm. long. The dorsal and anal rays were counted in 14 specimens, wherein the counts remain within the range given elsewhere for 30 specimens; P. 14 or 15; scales 41 to 47.

The following proportions are based on 4 specimens, 40 to 49 mm. long: Head 3.5 to 3.8; depth 3.7 to 4.3. Eye in head 3.2 to 3.4; snout 3.1 to 3.3; maxillary 3.3 to 3.9; pectoral 1.0 to 1.15.

West Indies to Florida.

S. F. H.

Malacoctenus versicolor (Poey)

This fish was noticed in beach rock on the east side of Loggerhead Key, under one of the isolated coral heads on Bird Key flats, outside Bird Key reef, and on eroded faces of the larger corals of Loggerhead bank.

The pectoral rays are 14. Of 6 Tortugas specimens, 3 have D. XX, 12; A. II, 21; 1 has an anal ray less, and another a dorsal and 2 anal rays less. The first 3 dorsal spines decrease progressively in length, and because of the shortness of the 18th there is a second depression in the fin. A bifid cirrus at the anterior nostril usually present; also a bifid or trifid ocular cirrus with its longest element about equal to diameter of eye; a comb of 6 cirri; scales 8-55-18.

Outstanding elements in the color pattern are six brown bands on the sides, narrower below, darker and more nearly solid in color in the male, lighter in the female and more broken by ground color; the anterior ones continuing more or less plainly on dorsal fin. The sexes are readily distinguished in life by the red ground color of the male, and the straw or cream color of the female. The female alone has the dorsal, anal, and caudal rays spotted.

Besides being distinguished by differences in color, the sexes, like those of

related species, are recognizable by their external genitalia or associated structures. In the male a well marked urogenital papilla is visible, which has 12 to 15 folds in the mucous membrane. In the female the folds are so strongly developed that the urogenital papilla is lost in a brushlike tuft composed of the cilia on their free margins.

Included in the diet are copepods, amphipods, and delicate algae. Eggs of *Abudefduf* on coral faces are freely eaten when the guardian male is absent for a moment.

I have seen the female pursue the male, or female pursue female, the two seizing each other by the jaws and twisting them viciously.

As early as the first week in June the ovaries are well developed. In mid-July two males seemed to be guarding eggs, as they dashed repeatedly at approaching *Halichoeres bivittatus*, but their activity was too diffuse to permit me to find the eggs in their charge, if any were present.

W. H. L.

This species is represented in the collection by 42 specimens, 26 to 82 mm. long. The following proportions and enumerations are based on 2 specimens, 50 and 60 mm. long: Head 3.5, 3.5; depth 4.3, 4.1. Eye in head 3.1, 3.5; snout 3.1, 3.3; maxillary 3.1, 3.4; pectoral 1.0, 1.05. D. XX, 12, XX, 12; A. II, 21, II, 21; P. 14, 14; scales 55, 58.

West Indies to Florida.

S. F. H.

Labrisomus Swainson

Labrisomus Swainson, Nat. hist. classn. fishes, vol. 2, 1839, p. 277 (*Clinus pectinifer* Cuvier and Valenciennes = *Clinus nuchipinnis* Quoy and Gaimard).

Lepisoma De Kay, New York fauna: Fishes, 1842, p. 41 (*L. cirrhosum* De Kay = *Clinus nuchipinnis* Quoy and Gaimard).

Gobioclinus Gill, Proc. Acad. Nat. Sci. Philadelphia, vol. 12, 1860, p. 103 (*Clinus gobio* Cuvier and Valenciennes).

Erieteis Jordan, Bull. U. S. Fish Comm., vol. 22, 1902 (1904), p. 543 (*E. kalisheræ* Jordan).

Erieteis was proposed to receive species differing from nearly related ones in having teeth on the palatines. The misconception is as old at least as Jordan and Evermann's definition of the genus *Labrisomus* (Bull. U. S. Nat. Mus., No. 47, pt. 3, 1898, p. 2361), which stated that the genus has no palatine teeth. In *L. nuchipinnis*, *xanti*, *gobio*, and others, however, they are stout and strong.

The reasons for placing *Gobioclinus* in synonymy are shown in the discussion of *Labrisomus gobio*.

W. H. L.

Labrisomus nuchipinnis (Quoy and Gaimard)

(Plate 30, figure 2)

Clinus nuchipinnis Quoy and Gaimard, Voy. Uranie, Zool., 1824, p. 255—Rio de Janeiro. *Blennius herminier* Le Sueur, Jour. Acad. Nat. Sci. Philadelphia, vol. 4, 1825, p. 361—St. Bartholomew.

Clinus pectinifer Cuvier and Valenciennes, Hist. nat. poiss., vol. 11, 1836, p. 374—Bahia (female).

Clinus capillatus Cuvier and Valenciennes, *ibid.*, p. 377—Martinique (male).

Clinus canariensis Valenciennes, in Webb and Berthelot, Poiss. Îles Canaries, 1839, p. 60, pl. 17, fig. 3—Canary Islands (female).

Lepisoma cirrhosum De Kay, New York fauna: Fishes, 1842, p. 41, pl. 30, fig. 94—Florida.

Labrisomus microlepidotus Poey, An. Soc. esp. hist. nat., vol. 19, 1880, p. 246, pl. 8, fig. 2—Cuba.

Labrisomus lentiginosus Bean, Proc. Biol. Soc. Washington, vol. 19, 1906, p. 31—Bermuda; Field Columbian Mus., Zool. Ser., vol. 7, 1906, p. 83, fig. 13.

Rare at Tortugas, but usually found among concrete blocks beside the channel north of Fort Jefferson or among slabs of beach rock east or west of Loggerhead Key. A broken sea urchin in a 2-quart jar near its hiding place tempts it almost irresistibly, and it may be easily caught by a diver kneeling near by ready to clap his hand over the mouth of this trap when the fish has entered.

It is a shy fish, alert and brisk in its movements. It excavates a retreat beneath some stone, out of which it "blows" sand by strong swimming motions of its tail, and comparatively large pieces of coral are removed in its jaws.

The sexes are very different in appearance; the coloration is highly changeable; local races are in process of differentiation or have been differentiated recently in parts of the great area occupied. For these and other reasons it has borne many names, though its outstanding features are strikingly constant throughout its range.

The typical form occurs in Bermuda, throughout the West Indian and Caribbean region, and at least as far south as southern Brazil. Its narrow range of variation in fin formulas is shown in table 8. In 86 specimens of a sample of 91, the combination is D. XVIII,12; A. II,18 or 19.

The name *herminier* has been in the record for a species of this genus for more than a century. Meanwhile the type has been lost. That Le Sueur (see citation above) had a *Labrisomus* is certain, as the 3 ventral rays, scaly body, fleshy lips, ciliated appendage at the nostril, supraocular fascicle of cilia, nuchal combs, and conic palatine teeth are diagnostic. As to the species, there is little doubt that it is *L. nuchipinnis*, as the size of the type (125 mm.) almost completely excludes other known species of the genus. The anal fin formula in *L. herminier*, 20 (or II,18) rays, is the number most frequently occurring in *L. nuchipinnis*, and rare in other West Indian *Labrisomus*, except in the tiny *albigenys*. The 12 dorsal rays reported is the almost invariable number of *nuchipinnis*, whereas that many are rather exceptional in other *Labrisomus* in the region; and although 16 dorsal spines are too few, there is no known species which approaches this number more nearly than *nuchipinnis*. A dark spot on the fore part of the dorsal fin, a spotted pectoral, and a netted pattern on the cheek of *L. herminier* are also present in one or both sexes in *L. nuchipinnis*. Therefore, it is almost certain that *Blennius herminier*, based on a large female found apparently at a beach where *Labrisomus nuchipinnis* also may be collected, is a synonym of that species.

The types of *Labrisomus microlepidotus* Poey (U. S. Nat. Mus. no. 37572) are 2 females 153 and 164 mm. in total length. The fin formulas in these are those commonest in *L. nuchipinnis*, including its almost invariable 14 pectoral rays. Despite the alleged difference in squamation, I can find nothing therein which separates the two. In the types of *L. microlepidotus* the cheeks and branchiostegal

TABLE 8

VARIATION IN DORSAL AND ANAL FIN FORMULAS IN *Labrisomus nuchipinnis*

LOCALITY AND MUSEUM NO.	FIN FORMULAS		No. SPEC- IMENS
	Dorsal	Anal	
Bermuda:			
U. S. Nat. Mus. 21240.....	XVIII,12	II,18	1
	XVIII,12	II,19	2
U. S. Nat. Mus. 21380.....	XVIII,12	II,17	1
	XVIII,13	II,19	1
Brit. Mus. 72.8.28.54-6.....	XVIII,12	II,18	1
	XVIII,12	II,19	2
Brit. Mus. 80.9.14.23.....	XVIII,12	II,19	1
Bahamas:			
Univ. Lund.....	XVIII,12	II,19	1
Florida:			
U. S. Nat. Mus. 6253, 6256:			
St. Augustine.....	XVIII,12	II,18	29
New Smyrna.....	XVIII,12	II,19	1
Tortugas.....	XVIII,12	II,18	1
	XVIII,12	II,19	2
	XIX,12	II,19	1
Cuba:			
U. S. Nat. Mus. 13039, 4783, 24950, 37574....	XVIII,12	II,18	3
	XVIII,12	II,19	2
Rio de Janeiro:			
Brit. Mus. 1923.7.30.313-14.....	XVIII,12	II,18	2
Jamaica:			
Brit. Mus. 47.7.1.3.....	XVIII,12	II,18	1
Puerto Rico:			
U. S. Nat. Mus. 63046, 73034.....	XVIII,12	II,18	2
	XVIII,12	II,19	4
Vera Cruz, Mexico:			
U. S. Nat. Mus. 37793.....	XVIII,12	II,18	1
Panama:			
U. S. Nat. Mus. 81915-6.....	XVIII,12	II,17	1
	XVIII,12	II,18	13
	XVIII,12	II,19	2
	XVIII,13	II,18	1
	XIX,11	II,18	1
St. Croix:			
Brit. Mus. 63.8.7.168-9.....	XVIII,12	II,19	2
St. Lucia:			
U. S. Nat. Mus. 41290.....	XVIII,12	II,18	2
St. Vincent:			
Brit. Mus.....	XVIII,12	II,18	2
Barbados:			
U. S. Nat. Mus. 5924.....	XVII,12	II,19	1
	XVIII,12	II,18	1
Tobago:			
Brit. Mus. 1920.12.22.174-183, 1922.6.22.110...	XVII,13	II,18	1
	XVIII,12	II,18	5
	XVIII,12	II,19	5

membranes seem sparsely spotted with light on a dark ground, rather than finely netted with brown about light spots. But a female from Tortugas shows a spotted pattern intermediate in texture between that of the Cuban specimens and others of the usual appearance, which makes it seem doubtful whether *L. microlepidotus* may be definitely recognizable even as a color variety.

Between the eastern Atlantic form, represented in the British Museum collection by specimens from Madeira, Cape Verde Islands, and the Gold Coast, and the typical form from the western Atlantic there seems to be no significant difference in gill rakers, scales, or fin supports. The eastern *Clinus canariensis* Valenciennes (see citation above) may be a fish of smaller size. It differs from the western form chiefly in the coloration of the female, which in the latter has a finer reticulate pattern on cheek and throat, more rows of smaller spots on the fins—especially on the pectorals—and a distinctive reticulum of dark lines about light spots on the pectoral base posteriorly. A specimen in the British Museum from South Trinidad may represent another recognizably distinct stock.

Coming from under ledges this fish may be almost black, but in the open it tends to show in the mottled brown, gray, and green of its irregularly banded pattern the colors of alga-covered rocks. It is paler over light bottom than dark, and paler too at night than during the day.

Differences in the external genitalia of the sexes are evident before the fish have attained half adult size. Their darker color, their suffusion with red, especially ventrally, and their ocelli serve also to distinguish the males.

The head of a female 140 mm. long is represented in plate 30, figure 2. If the fish rolls the eye widely it shows about half the patterned surface of the eye in a position of rest. Strong lines of the extraocular pattern extending on the eye and the iris carry the general pattern to the pupillary border. W. H. L.

Represented in the collection by 6 large specimens, 128 to 157 mm. long. The following proportions and enumerations are based on 2 specimens, 155 and 157 mm. in length: Head 3.1, 3.3; depth 3.4, 3.4. Eye in head 4.9, 4.6; snout 3.2, 3.1; maxillary 2.0, 2.0; pectoral 1.4, 1.25. D. XVIII, 12, XVII, 11; A. II, 19, II, 19; P. 14, 14; scales 65, 68.

A widely distributed species, known on the American coast from Brazil to the West Indies, the Bahamas, and the south Atlantic states. S. F. H.

Labrisomus kalisherae (Jordan)

Eriteis kalisherae Jordan, Bull. U. S. Fish Comm., vol. 22, 1902 (1904), p. 543, pl. 2, fig. 4—Tortugas, Florida. Jordan and Thompson, Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 254.

Clinus bucciferus Metzelaar (part not of Poey), Trop. atl. Vissch., 1919, p. 154.

Labrisomus bucciferus Longley (part not of Poey), Carnegie Inst. Wash. Year Book No. 31, 1932, p. 300.

Not rare at Tortugas. It may be obtained most readily by picking up and breaking to pieces in a tub clumps of branching *Porites* from the inner margin of Bird Key reef. In deeper water it is not uncommon under pieces of dead coral, and may be seen too at times slipping in and out of crevices in Orbicellas.

Except for a specimen from British Honduras registered as *Labrisomus nuchi-*

pinnis (U. S. Nat. Mus. no. 49151), I have seen specimens only from Tortugas. The proportions of the anterior dorsal spines are not quite as in Jordan's figure, as the 2d is a little longer than the 1st and very distinctly longer than the 3d. The fin, therefore, has a distinct anterior lobe. The supports in dorsal and anal fins in 16 specimens, including the type and the Honduran specimen, are D. XIX,11; A. II,19, with 1 specimen from Tortugas having an anal ray less, and another having an anal ray more; P. 14.

The shade of this fish changes readily in adaptation to its surroundings. The pattern is by contrast relatively stable, and in palest phases appears in two shades of gray. The darker elements include three lines crossing interorbital space, a triangular sector on cheek, a saddle under first 2 dorsal spines, and five bars across trunk and dorsal and anal fins. The dark bars are darkest peripherally, and the light ones lightest. In dark phases the former are suffused with much red, the latter grow yellow-olive, and the dorsal surface and sides of head may remain gray to the 2d spine.

W. H. L.

The collection contains 28 specimens, 34 to 78 mm. long. The following proportions and enumerations are based on 3 specimens, 55, 65, and 78 mm. long: Head 3.0, 3.0, 2.8; depth 4.5, 3.9, 3.7. Eye in head 3.3, 3.3, 3.7; snout 4.3, 4.0, 3.6; maxillary 2.15, 1.9, 2.2; pectoral 1.5, 1.1, 1.25. D. XIX,11, XIX,11, XIX,11; A. II,18, II,19, II,19; P. 13, 13, 13; scales 48, 51, 53.

Dutch West Indies, British Honduras, and Florida.

S. F. H.

***Labrisomus haitiensis* Beebe and Tee-Van**

Labrisomus nuchipinnis Rosén (not of Cuvier and Valenciennes), Acta Univ. Lund., Årsskr., vol. 7, 1911, p. 66—Bahamas.

Labrisomus haitiensis Beebe and Tee-Van, Zoologica, vol. 10, 1928, p. 232, with fig.—Port-au-Prince Bay, Haiti.

Probably not rare at Tortugas, though rarely collected. A single specimen was taken with many of *Labrisomus kalisherae* in clumps of *Porites* inside Bird Key reef. Four or 5 others were found under pieces of dead coral near the inner margin of the reef off the Laboratory wharf on the west side of Loggerhead Key.

There are few museum specimens. Beebe and Tee-Van had only 1. The Museum of Comparative Zoölogy (no. 12598) has one in a lot with other blennies collected at Fort Jefferson, Tortugas. The U. S. National Museum has 1 (no. 73062) collected by the *Fish Hawk* at station 7216 (lat. 28° 26' N.; long. 83° 02' 30" W.) in 7½ fathoms. In the Biological Institute of the University of Lund are 2 more from the Bahamas.

The fin rays of the type are D. XX,11; A. II,20; P. 14. Two specimens from the Bahamas have D. XXI,11 or 12; A. II,21; P. 14, except that on one side one fish has only 10. Seven Florida specimens have D. XX to XXII,10; A. II,20 to 22; P. 13 to 15.

Its bands are sharply drawn on the dorsal, and more sharply on the anal than in other species except *bucciferus*. The opercle has a dark spot without suggestion of ocellation. It is readily distinguished by its long ventral fins that reach the anal origin, whereas in other species they usually fall distinctly short of the vent. The

ocular cirri are somewhat stout, usually palmate, and about 6- to 8-parted; nuchal combs much simpler than in related species, usually showing no more than 5 divisions; scales larger, usually 3 or 4-44 or 45-14. Even the fin formulas tend to set it apart, for in every instance the count in some respect exceeds the limit attained by 61 specimens of *bucciferus*, the species nearest it in this respect.

The largest specimen observed was only 70 mm. in length. W. H. L.

The collection contains 3 specimens, 38, 39, and 58 mm. long. The fin-ray and scale counts agree with those given by Dr. Longley. The following proportions are based on the smallest and largest specimens in the collection: Head 3.3, 3.3; depth 4.3, 4.5. Eye in head 2.7, 2.9; snout 4.5, 4.75; maxillary 2.1, 2.3; pectoral 1.0, 1.1.

West Indies, Bahamas, and Florida.

S. F. H.

Labrisomus bucciferus Poey

Labrisomus bucciferus Poey, Repertorio, vol. 2, 1868, p. 399—Cuba.

Labrisomus nuchipinnis Rosén (part not of Quoy and Gaimard), Acta Univ. Lund., Årsskr., vol. 7, 1911, p. 66. Breder (part), Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 86—Glover Reef.

Labrisomus heilneri Nichols, Amer. Mus. Nov., No. 26, 1921, p. 2, fig. 2—Bahamas.

This species is not known from Tortugas.

In Vienna there is a specimen, identified by Steindachner as "*Clinus nuchipinnis* C. & V.," which on its label has the notation "*Labrisomus bucciferus* Poey, Typus." That this fish is the type seems almost certain, as its length is 55 mm., as Poey stated. Its pectoral rays are 13 on one side and 12 on the other, the latter being Poey's count, though that number does not occur again in 60 other specimens examined. The dorsal fin has XX,11 rays, as Poey stated, and the anal II,20, which is a ray more than he gave.

From the data in table 9 the mode in respect to fin formulas is definitely determinable and the range of variation approximately so. It will be noticed that the range of variation in *L. bucciferus* overlaps that in several related species, from which on other grounds it is readily distinguished.

The color pattern and general appearance are well represented in Nichols' figure of *L. heilneri* (see reference above), in which attention may be drawn to broken bands on the body, banding on the anal fin, and a faint dark line down and back from the eye paralleling the preorbital border. Below this line the cheek is usually distinctly dark. Above it the postorbital region is abruptly paler and sometimes dark-spotted.

Dutch West Indies, West Indies, Glover Reef, and the Bahamas. W. H. L.

Labrisomus guppyi (Norman)

Labrisomus nuchipinnis Rosén (part not of Quoy and Gaimard), Acta Univ. Lund., Årsskr., vol. 7, 1911, p. 66—Andros Island, Bahamas.

Clinus herminier Metzelaar (not of Le Sueur), Trop. atl. Vissch., 1919, p. 153—Curaçao; Bonaire.

Clinus guppyi Norman, Ann. and Mag. Nat. Hist., ser. 9, vol. 9, 1922, p. 533—Tobago.

Labrisomus heilneri Parr (not of Nichols), Bull. Bingham Oceanog. Coll., vol. 3, art. 4, 1930, p. 126—West Caicos and Turks Islands, Bahamas.
Malacotenus bucciferus Fowler (not of Poey), Proc. Acad. Nat. Sci. Philadelphia, vol. 82, 1930, p. 275—Grenada.
Malacotenus bondi Fowler, *ibid.*, p. 275—Grenada.
Labrisomus bucciferus Longley (not of Poey), Carnegie Inst. Wash. Year Book No. 32, 1933, p. 294.

This blenny was not taken at Tortugas.

In small fish up to 57 mm. or so there is on the opercle a dark spot half the size of the eye which is sometimes semiocellated. In larger specimens it is less conspicuous. For the rest, this is an irregularly banded fish, in appearance most like *Labrisomus kalisherae*. Distinguishable in structure, however, by the presence of scales in mid-line before dorsal, and by the filaments of the nuchal combs, which, instead of being in a single series, are more or less in three tufts.

Variation in supports of the vertical fins in material examined is shown in table 10. Pectoral rays almost constantly 13; scales 7 or 8-50 or 51-14, present on

TABLE 9

VARIATION IN DORSAL AND ANAL FIN FORMULAS IN *Labrisomus bucciferus*

LOCALITY AND MUSEUM NO.	FIN FORMULAS		No. SPECIMENS
	Dorsal	Anal	
Cuba:			
U. S. Nat. Mus. 82527-8-9-30.....	XIX,11	II,19	2
	XIX,12	II,19	1
	XIX,12	II,20	1
	XX,10	II,19	2
	XX,10	II,20	2
	XX,11	II,19	4
	XX,11	II,20	37
	XX,12	II,20	1
	XXI,11	II,20	1
Vienna 1874.1.1063 (very probably the type)...	XX,11	II,20	1
Bahamas:			
Vienna 1874.1.1063a.....	XX,11	II,19	1
Univ. Lund.....	XIX,11	II,19	1
	XX,11	II,20	2
	XXI,11	II,20	1
Amer. Mus. Nat. Hist. 7769.....	XX,10	II,20	1
Curacao:			
Amsterdam.....	XX,11	II,19	1
	XX,11	II,20	1
	XX,11	II,19	1
Glover Reef:			
Bingham Oceanog. Coll. 379.....	XX,11	II,20	1

nape in mid-line before dorsal; cirri of nuchal combs in fish of about 40 mm. begin to branch from the base, half the cirri double in specimens of 50 mm., half trifid at 57 mm., the proportion increasing in larger ones with the result that the comb is composed of tufts of about three elements standing in series on the short and thin basal lamina.

TABLE 10
VARIATION IN DORSAL AND ANAL FIN FORMULAS IN *Labrisomus guppyi*

LOCALITY, MUSEUM NO., AND REGISTERED NAME	FIN FORMULAS		No. SPEC- IMENS
	Dorsal	Anal	
Tobago:			
Brit. Mus. 1920.12.22.187, <i>Clinus guppyi</i> , type.	XIX,11	II,18	1
Brit. Mus. 1931.12.5.365, <i>C. nuchipinnis</i>	XIX,11	II,19	1
Fernando de Noronha:			
Brit. Mus. 88.1.19.92-101, <i>C. delalandi</i>	XIX,11	II,20	1
Curaçao and Bonaire:			
Amsterdam, <i>C. herminier</i>	XVIII,11	II,18	1
	XIX,10	II,18	2
	XIX,11	II,18	2
	XIX,11	II,19	2
Grenada:			
Acad. Nat. Sci. Phila. 52504, <i>Malacotenus bondi</i>	XIX,11	II,18	1
Acad. Nat. Sci. Phila., <i>M. bucciferus</i>	XIX,12	II,18	1
Cuba:			
U. S. Nat. Mus. 37423 (part), <i>Labrisomus</i> <i>nuchipinnis</i>	XIX,12	II,19	1
U. S. Nat. Mus. 37426 (part), <i>L. nuchipinnis</i> ..	XIX,11	II,19	2
U. S. Nat. Mus. 82532, <i>Labrisomus</i>	XVIII,12	II,19	1
	XIX,10	II,18	1
	XIX,11	II,19	7
	XIX,10	II,19	1
W. Caicos I.:			
Bingham Oceanog. Coll. 2620, <i>L. heilneri</i>	XIX,10	II,18	1
Andros I.:			
Univ. Lund (part), <i>L. nuchipinnis</i>	XIX,11	II,19	2

The type of *Malacotenus bondi* is not well preserved, at least as to color. The pectoral fin is indeed dark basally, but the suggestion of ocellation in the figure accompanying the original description apparently was derived largely from artifact. The fish seems structurally the same as the type of *Clinus guppyi*, and it has precisely the same fin formulas, though in the figure the dorsal spines shown are 2 too many and the soft rays correspondingly too few.

British West Indies to the Bahamas.

W. H. L.

Labrisomus gobio (Cuvier and Valenciennes)

Clinus gobio Cuvier and Valenciennes (part), Hist. nat. poiss., vol. 11, 1836, p. 395—Lesser Antilles.

Gobioclinus gobio Gill (part), Proc. Acad. Nat. Sci. Philadelphia, vol. 12, 1860, p. 103.

Not known to occur at Tortugas.

The "types" of *Clinus gobio* consist of a lot of 5 small fish, which prove to belong to two species. To the largest one of the 5 precedence is given in the original description. Though not now in good condition, it is still readily enough recognizable. The smaller fish belong to the species Evermann and Marsh (see p. 246) later named *Gillias jordani*.

The length of the single "*Clinus*" included in the lot, which must be considered the type, is about 50 mm.; length to base of caudal 42 mm.; head 14 mm.; eye 5.0 mm. D. XVIII, 11; A. II, 19; P. 13; V. 1, 3; no scales before dorsal origin, and there appear to have been 48 or 49 in lateral line; 3 or 4 palatine teeth on either side, which are abruptly larger than the 10 or so in a single series along anterior border of vomer; ocular cirrus transverse and pectinate; nuchal cirri also pectinate, and separated by a distance equal to base of either; color pattern completely lost.

Rare in collections. The smaller Bahaman specimen to which Nichols referred in his description of *Labrisomus heilneri* belongs here, as do 3 from Cuba which are now with *L. bucciferus* in the U. S. National Museum (no. 82529).

In the 4 fish just mentioned I find D. XIX, 11 or 12; A. II, 19; P. 13; ventrals short, not reaching vent; scales about 5-48 or 49-13. Dorsal with a depression before the last spine which is deeper than in *L. bucciferus*. The five brownish bars crossing the body are continuous rather than subcontinuous, are more regular in outline than in *bucciferus*, and do not continue sharply and narrowly on the anal fin.

This seems to be a small species, as the largest known example is only about 50 mm. long. The short snout, thick head, and deep notch in the dorsal fin tend to identify it.

Lesser Antilles to the Bahamas.

W. H. L.

Starksia Jordan and Evermann

Starksia Jordan and Evermann, in Jordan, Proc. Calif. Acad. Sci., ser. 2, vol. 6, 1896, p. 231 (*Labrosomus cremnobates* Gilbert).

Brannerella Gilbert, Proc. Washington Acad. Sci., vol. 2, 1900, p. 180 (*B. brasiliensis* Gilbert = *Clinus ocellatus* Steindachner).

This genus was segregated from *Labrisomus* on the ground that it has larger scales, palatine teeth, a short soft dorsal fin, and no comb of nuchal filaments. Species of *Labrisomus* do have palatine teeth, however, and it is a *comb* of nuchal filaments that is lacking, and not filaments themselves, as each fish has an inconspicuous pair.

The distinctions between *Brannerella* and *Starksia*, after examination of the type material, do not seem sufficient to retain the two as separate genera.

W. H. L.

Starksia ocellata (Steindachner)

Clinus ocellatus Steindachner, Ichthyol. Beitr., No. 5, 1876, p. 182, pl. 12, fig. 5—Bahamas.
Malacoctenus culebrae Evermann and Marsh, Rept. U. S. Fish Comm., pt. 25, 1899 (1900),
p. 357—Culebra Island, Puerto Rico; Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902),
p. 308, fig. 96.

Brannerella brasiliensis Gilbert, Proc. Washington Acad. Sci., vol. 2, 1900, p. 180, pl. 9,
fig. 1—Maceio, Brazil.

Common at Tortugas, where it may be obtained by picking up and breaking isolated clusters of the branching *Porites porites* from the inner margin of Bird Key reef, or at depths of 10 feet, where it occurs under the sea urchin *Centarchinus setosum*, and in eroded corals, particularly near the northern end of Loggerhead bank. It was taken several times in 10 fathoms within the Tortugas atoll, and the British Museum has a specimen obtained in 34 fathoms, at $11^{\circ} 50' S.$, $38^{\circ} 47' W.$

It does not "sit" with its body elevated on its ventral fins as do species of *Malacoctenus* with which it was associated. When its covering urchin is removed it slips quickly into crevices in the coral.

In specimens 40 to 47 mm. in total length, the snout is less than the eye, 5.0 in head; the head equals the depth, 5.0 in length; scales in lateral line 39; D. XXI, 8 or 9, the first 3 spines shorter and weaker, the fin deeply emarginate at the 19th spine; A. II, 18 or 19 in females; I-I, 18 or 19 in males. The urogenital papilla extends along anterior face of 1st anal spine and projects beyond its tip, spine and duct together forming an intromittent organ, as the corresponding structures in the female clearly indicate. Ventrals short, I, 3, last ray rudimentary, extending little more than halfway to vent; P. 14, rays all simple, reaching 2d anal spine; a simple tentacle on anterior nostril, one over eye, and one on either side of nape; teeth close-set, recurved canines, a single row in either jaw, an additional patch of villiform teeth in the angle; shorter and blunter teeth on vomer and palatines.

Body with dark saddle-like blotches or half-bands, the first on occiput, the second on nape, center of third under 1st spine, the fourth under 2d and 3d spines; seven others following; two series of smaller and more numerous blotches below; orange spots below and before eye; dark spots with orange centers on cheek and opercle, pectoral base, and base of pectoral rays, all smaller than pupil; some specimens with spots of the same sort, with less conspicuous orange centers, on trunk throughout its length, perhaps more common in males, but not strictly a secondary sexual character; brown spots in oblique rows running down and back on dorsal fin supports; caudal crossbanded with yellow; anal irregularly mottled anteriorly, orange-spotted posteriorly; lower jaw dark at tip; no markings under throat.

The shade is highly changeable, generally in adaptation to the shade of the surroundings.

W. H. L.

The collection contains 16 specimens, 12 to 41 mm. long. The following proportions and enumerations are based on 2 specimens, 25 and 32 mm. in standard length, and a paratype of *Malacoctenus culebrae*, which has been synonymized

herein with *Starksia ocellata*, 25 mm. in standard length. The numbers in parentheses are based on the paratype. Head 3.1, 3.4 (3.6); depth 4.6, 5.1 (5.0). Eye in head 3.6, 4.75 (3.7); snout 5.0, 5.9 (5.8); maxillary 2.2, 2.0 (2.3); pectoral 1.2, 1.1. D. XXII,8, XXII,7 (XXI,9); A. II,18, I-I,17 (II,19); P. 13, 14 (14); scales 38, 36 (36). The lateral line generally, but not always, is resumed at a lower level after it is interrupted over about the origin of anal.

Brazil to Florida.

S. F. H.

Starksia fasciata (Longley)

Malacoctenus lugubris Rosén (not of Poey), Acta Univ. Lund., Årsskr., vol. 7, 1911, p. 67, fig. 6—Bahamas.

Brannerella fasciata Longley, Carnegie Inst. Wash. Year Book No. 33, 1934, p. 258—Bahamas.

Not found in the Tortugas.

D. XIX,8, the spines after the first 3 increasing in length, diminishing again to the 16th, after which they are progressively longer; A. II,14, the 1st spine isolated, the genital papilla adnate to it, its tip extending beyond that of the 1st ray; V. I,2, not reaching vent; vomerine teeth present; a simple tentacle at nostril, one above eye, and another at nape.

Body with seven brown bars on a lighter ground; opercle dark, distinctly darker toward lower margin of the dark area.

It differs from known species in coloration and fin formulas. Two specimens known: a male, the type, 22 mm. long; and the cotype, a female, 15 mm. long, from the Bahamas. Both are in the Museum of the Biological Institute, University of Lund, in poor condition.

W. H. L.

*Auchenopterus*¹ *nigripinnis* (Steindachner)

Clinus nigripinnis Steindachner, (Sitzungsber. Akad. Wiss. Wien, vol. 56), Ichthyol. Notizen, No. 6, 1867, p. 351—Barbados.

Auchenopterus affinis Jordan and Evermann (not *Cremnobates affinis* Steindachner), Bull. U. S. Nat. Mus., No. 47, pt. 3, 1898, p. 2371—Key West, Florida. Metzelaar, Trop. atl. Vissch., 1919, p. 156—Curaçao. Longley, Carnegie Inst. Wash. Year Book No. 31, 1932, p. 300.

Auchenopterus albicaudus Evermann and Marsh, Rept. U. S. Fish Comm., pt. 25, 1899 (1900), p. 360—Arroyo, Puerto Rico; Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 313, fig. 99.

Auchenopterus rubescens Evermann and Marsh, Rept. U. S. Fish Comm., pt. 25, 1899 (1900), p. 360—Puerto Real, Puerto Rico; Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 314, fig. 100.

Auchenopterus fajardo Evermann and Marsh, Rept. U. S. Fish Comm., pt. 25, 1899 (1900), p. 361—Fajardo, Puerto Rico; Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 313, pl. 47.

Auchenopterus fasciatus Jordan and Thompson, Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 254—Tortugas, Florida.

?*Auchenopterus rubicundus* Starks, Stanford Univ. Pub., Univ. Ser., 1913, p. 74, pl. 15—Natal, Brazil.

¹ According to Margaret Storey (Copeia, No. 2, 1940, p. 81), *Auchenopterus* is pre-occupied, the oldest name available being *Paraclinus*.—S. F. H.

Taken occasionally in turtle grass on Long Key flats and inside Bird Key reef, also in beach rock along the east side of Loggerhead Key, attaining a length of at least 50 mm.

The type of *Clinus nigripinnis*, 40 mm. long, has the fin formulas D. XXIX,1; A. II,17, although in the original description the anal rays were said to be 27. Dorsal not notched behind 3d spine; tip of maxillary extending slightly beyond orbit; opercular spine flat, compound, bifid at the tip on one side, trifid on the other; ocular cirrus ending in several points and in length slightly exceeding half vertical diameter of eye; nuchal cirrus divided.

Anal fin uniformly dusky, the other color largely lost, though a trace of the ocellus may be seen between the 22d and 24th spines.

Eleven Tortugas specimens had the fin formulas D. XXX or XXXI,1; A. II,17 or 18; opercular spine flattened, compound, ending in 2, 3, or 4 points; nasal cirrus simple; supraorbital and nuchal cirri flat, thin, expanded transversely, deeply cleft, usually 5- and 4-parted.

Dominant color of females and young males brownish olive, with a general grayish cast from tip of snout to dorsal origin, through interorbital space, and over nape; a dark stripe from lower jaw on either side crossing oral cleft, through eye, and continued on body; a series of light spots on cheek, operculum, pectoral base, and along side just below level of straight part of lateral line; body with eight crossbands, wider than interspaces, continuing on dorsal fin, the last five extending similarly on anal; a dorsal ocellus in next to the last band; cheek pale, except for a dark dash running down and back from below orbit; throat faintly marbled; iris marked with radial dashes of dark and light; spots on rays of ventral fins, and in series across pectorals; caudal dark at base and nearly free from color elsewhere.

The males are darker in color after attaining a length of upwards of about 25 mm., as their secondary sexual differences then have become more distinct. Their mouths grow larger, their cirri a little stouter, their coloration becomes darker and more nearly uniform, and at the same time the notch in the dorsal fin becomes less and less evident until it may be very shallow.

In alcohol the color shortly becomes red, but as the red pigment is alcohol-soluble the phase is a transient one and in a relatively short time only traces of the original pattern may be left.

Material examined includes the types of *Clinus nigripinnis*, *Auchenopterus albicaudus*, *A. rubescens*, and *A. fajardo*. The type of *albicaudus* is inaccurately described and figured, as its pectoral fins were drawn much too long. The membrane behind its 3d dorsal spine is torn, but careful manipulation shows that it joins the 4th about a third of the way up from its base. Therefore it is merely an ordinary specimen of *A. nigripinnis* in a pale phase or decolorized by the treatment it has received. The type of *fajardo* is like that of *nigripinnis*, and quite the same as the largest of a graded series from Tortugas. Besides these types and collections from Tortugas, the following have been examined: 3 specimens from Key West and Crawfish Bar, Florida; 1 from Governor's Island, Bahamas; Rosén's Bahaman collection, *A. albicaudus*, *A. rubescens*, and *A. fajardo* (Acta Univ. Lund., Årsskr., vol. 7, 1911); 4 specimens from Cabañas Bay, Cuba; Beebe

and Tee-Van's collection from Port-au-Prince Bay, Haiti, *Cremnobates fajardo* (Zoologica, vol. 10, 1928, p. 239); 2 specimens from Barbados (1 is like *A. nigripinnis*, for which this is the type locality); and Metzelaar's specimens from Curaçao. All have the compound opercular spine, which is diagnostic. Thirteen specimens in the U. S. National Museum in respect to fin formulas fall within the limits of the Tortugas sample, except that one Cuban specimen has no soft ray.

Auchenopterus fasciatus Jordan and Thompson from their description appears to be this species. Of the occurrence of *Auchenopterus fasciatus* (Steindachner) at Tortugas I have no supporting evidence. W. H. L.

The collection contains 26 specimens, 27 to 48 mm. long. The following proportions and enumerations are based on 6 specimens, 27 to 48 mm. long: Head 3.5 to 3.9; depth 4.1 to 4.8. Eye in head 4.0 to 4.8; snout 4.3 to 5.0; maxillary 1.65 to 2.8 (produced in adult males); pectoral 1.3 to 1.6. D. XXIX,₁ to XXXI,₀; A. II,₁₇ or 18; P. 12 or 13; scales 32 to 35.

The color in alcohol is very variable, some specimens being almost wholly pale and others brownish with distinct crossbars extending on the dorsal and anal fins. The dorsal ocellus remains visible in every specimen.

West Indies to the Bahamas and Florida and probably to Brazil. S. F. H.

***Auchenopterus marmoratus* (Steindachner)**

Rare locally, only 3 specimens having been collected, consisting of 1 small one taken in the seine, and 2 small ones secured by breaking up clumps of coral from the inner edge of Bird Key reef.

Fin formulas in Tortugas specimens, D. III-XXIV or XXV,₁; A. II,₁₉ or 20. Four specimens in the U. S. National Museum and 1 in the British Museum have D. III-XXIV to XXVI,₁; A. II,₁₈ to 20. Steindachner (Ichthyol. Beitr., No. 5, 1876, p. 174) wrote D. 3/27; A. 2/20. The 3d dorsal spine is more widely separated from the 4th than in other species of the genus, but its membrane joins the 4th spine a short distance above its base. The spine at angle of opercle is simple.

Upper side of head from snout to dorsal origin, throat, and side of head below level of eye pale and finely mottled; a stripe of pupillary width from tip of snout through eye and broadening on operculum; six blocks of solid color on dorsal, four on anal, uniting with a lateral stripe defined obscurely above but more sharply below; shade of fish changeable; fins with blue spots ocellated with orange and brown in concentric circles; usually three, rarely four, dorsal ocelli, within last three blocks of solid color; anal ocellus single, situated in last dark bar crossing fin, sometimes wanting. Acquiring at first a distinctly red color in alcohol, which soon fades. W. H. L.

The collection contains 2 specimens, 37 and 38 mm. long, on which the following proportions and enumerations are based: Head 3.0, 3.2; depth 3.8, 3.9. Eye in head 4.4, 4.5; snout 3.9, 4.25; maxillary 2.4, 2.6; pectoral 1.4, 1.5. D. III-XXIV,₁, III-XXVI,₁; A. II,₁₉, II,₂₀; P. 14, 15; scales 36, 38.

West Indies to Florida.

S. F. H.

***Auchenopterus fasciatus* (Steindachner)**

Cremnobates fasciatus Steindachner, Ichthyol. Beitr., No. 5, 1876, p. 176—Florida Strait.

Auchenopterus nox Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 7, 1884 (1885), p. 30—Key West.

Acanthoclinus chaperi Mocquard, Bull. Soc. philom. Paris, ser. 7, vol. 10, 1886, p. 19—Bay of Guanta, Venezuela.

Paraclinus chaperi Mocquard, *ibid.*, ser. 8, vol. 1, 1888 (1889), p. 41.

Auchenopterus affinis Meek and Hildebrand (not of Steindachner), Field Mus. Nat. Hist., Zool. Ser., vol. 15, pt. 3, 1928, p. 930—Fox Bay, Colon, Panama.

Cremnobates argus Beebe and Tee-Van, Zoologica, vol. 10, 1928, p. 238, with fig.—Port-au-Prince Bay, Haiti.

Though known from Key West and southward, it was not found at Tortugas.

The types of this species are 2 fish in Vienna, 29 and 34 mm. long, which according to the label came from Key West, a more precise locality record than that published in the original description. Steindachner gave D. 3/27; A. 2/20; but in one, as counted by me, it is D. III-XXVI; A. II,18, and in the other D. III-XXVII; A. II,19. The dorsal fin is deeply notched behind the 3d spine. Four specimens from Key West have 29 dorsal spines and 19 anal rays, and 2 others, from Florida, have 1 anal ray less. For reasons stated below, the writing of the fin formula as if the dorsal were composed of two fins is scarcely more than a convention.

The type of *Auchenopterus nox*, from Key West, has D. XXX; A. II,18; and the type of *Cremnobates argus* has D. XXX; A. II,17. These fish have an ocellus between the 23d and 25th spines, or sometimes between 22d and 24th or between 22d and 25th. The type of *C. argus* has also a lesser ocellus on the 16th spine and the web before it. Ocular cirrus variable, usually simple, but double on one side in the type of *A. nox*, sometimes more or less divided.

The type of *Paraclinus chaperi*, type species of its genus, is a specimen 40 mm. long, in fair state of preservation, in Paris. The dorsal fin is very slightly emarginate, and the formulas are D. XXXI; A. II,19; lateral line continuous to base of caudal, with about 36 scales, the last without a pore; supraocular cirri 4-parted on one side, simply divided on the other; on one side one and one-third times vertical diameter of eye, on the other only a little more than eye's diameter; the flat expanded nuchal lappets extending slightly beyond dorsal origin; dorsal ocellus between the 22d and 24th spines. Nothing appears to distinguish the genus from *Auchenopterus* except the continuous dorsal, which, according to specimens examined and the sexual differentiation of *A. nigripinnis*, is no more than a secondary sexual character. Numerous specimens examined from Curaçao and Aruba indicate the same thing, since at lengths less than 32 mm. none lacks the notch, as do some of the larger ones. A specimen from Colon illustrates the same in the reverse sense. In this female 46 mm. long, with abdomen distended by her large ovaries, the membrane behind the third dorsal joins the 4th spine only at the base.

Paraclinus chaperi Mocquard is apparently a south Caribbean representative of *A. fasciatus*, readily enough distinguished from the latter if one has a sample

of several, but probably not always separable in individual cases. With closer acquaintance it may be given specific rating, though it scarcely seems to merit it.
W. H. L.

Auchenopterus fasciatus was recorded from Tortugas by Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 254), but Dr. Longley concluded that their identification was wrong and that they had *A. nigripinnis*.

Known from Venezuela, Panama, the West Indies, and Florida. S. F. H.

Auchenopterus monophthalmus Günther

Auchenopterus monophthalmus Günther, Cat. fish. Brit. Mus., vol. 3, 1861, p. 275—Panama.

Cremnobates affinis Steindachner, Ichthyol. Beitr., No. 5, 1876, p. 178—St. Thomas, West Indies (or Panama?).

Not found at Tortugas.

There has been difference of opinion regarding the identity of *Auchenopterus affinis* (Steindachner). By most authors the name has been applied to a species in which the last dorsal fin support is articulated. As Meek and Hildebrand (Field Mus. Nat. Hist., Zool. Ser., vol. 15, pt. 3, 1928, p. 930) interpret the original description, however, it refers to one in which the dorsal fin is supported by spines only.

Regarding what these authors call *Auchenopterus affinis*, they write: "Our specimens seem to differ somewhat from published descriptions in having a slightly shorter dorsal fin, the formula given in current descriptions being III-XXVII,1; the original description gives III-XXVIII, stating specifically that the last spine (not ray) is attached to the base of the caudal by a membrane. Later authors state that the dorsal has one soft ray, which is not true of our specimens, and evidently not of the type."

It is not strictly correct, however, to say that Steindachner in his original description of *Cremnobates affinis* (see reference above) has given its dorsal fin formula as stated in this quotation. He actually wrote "D. 3/28," as he wrote for *C. marmoratus* "D. 3/27," although in that species, as is well known, the last dorsal ray is soft and articulated. Yet it at first seems certain that he is correctly interpreted above, for his text runs: "Der zweite Dorsale reicht nach hinten bis in die nächste Nähe der Caudale und die Membrane ihres letzten Stachels verbindet sich mit der Basis des oberen Caudalstrahles." As one reads on, however, it becomes evident that there was some looseness in the use of the terms *Stachel* and *Strahl*. It is clear, then, that one is not compelled to believe that the dorsal fin supports of *Cremnobates affinis* are spines only. Furthermore, there is in Vienna a specimen of *Auchenopterus*, the only one of 5 in the Museum of Natural History which does not have a type label. It bears the same accession number (1874.I) as the types of *Cremnobates marmoratus*, *C. fasciatus*, *Clinus bimaculatus*, and *C. ocellatus*, all described for the first time in the same paper with *Cremnobates affinis*. It carries still the notation "St. Thomas (an Panama)." The fact that it is marked merely "*Cremnobates*" is consistent with the sugges-

tion that it is the missing type of *affinis*, for the original description of that species was published with a query, as Steindachner was uncertain that it was really distinct from *A. monophthalmus* Günther, which species it is.¹

The fin formulas of this specimen are D. III-XXVI,1 (or XXIX,1); A. II,20, just as in all 3 of Günther's types of *A. monophthalmus*; a dorsal ray less and an anal ray more than Steindachner indicated. The discrepancy is regrettable, but insufficient to prove that Steindachner's count was not made on this specimen. Web of 3d dorsal spine joining 4th spine at its base; ocular cirri broadly flattened in the transverse plane, with four divisions, increasing in length if counted outward from the median border; its length approximately half vertical diameter of eye; nuchal cirri small; dorsal ocellus between 19th and 22d spines of second dorsal. In all these respects, with insignificant differences in detail, the type of *Cremnobates affinis* is like that of *A. monophthalmus*. Though the former has lost some of its scales, there seems to be no difference in the original number, which is 38 or 39.

West Indies; also recorded from the Pacific coast, from Panama to the Gulf of California.

W. H. L.

***Auchenopterus grandicornis* Rosén**

Auchenopterus grandicornis Rosén, Acta Univ. Lund., Årsskr., vol. 7, 1911, p. 69, fig. 5—Andros Island, Bahamas.

Only the type material in Lund was seen by me.

A well characterized species, with the great orbital cirrus flat, fringed on its inner border, reaching dorsal origin; nuchal cirrus also flat, with more or less emarginate distal border. In 3 specimens the fin formulas are D. XXVI,1; A. II,17; first 2 dorsal spines rather slighter than the others and closer together, the 3d separated from 2d and 4th by a wider interval than appears elsewhere; scales in lateral line about 30.

Dorsal fin with five crossbands on the higher, two under the lower anterior part; anal uniformly dark; caudal pale.

Known only from the Bahamas.

W. H. L.

***Auchenistius stahli* Evermann and Marsh**

Auchenistius stahli Evermann and Marsh, Rept. U. S. Fish Comm., pt. 25, 1899 (1900), p. 359—Ponce, Puerto Rico; Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 316, fig. 102.

Stathmonotus tekla Nichols, Bull. Amer. Mus. Nat. Hist., vol. 28, 1910, p. 161, fig. 1c—Key West, Florida.

Histioclinus veliger Metzelaar, Trop. atl. Vissch., 1919, p. 157, fig. 51—Bonaire.

Rather common at Tortugas, where it occurs in the interstices of the densely branched coral *Porites porites*.

The elongated maxillaries and membranous expansion of the lips are secondary

¹ Margaret Storey (Copeia, No. 2, 1940, p. 83) has stated that the last dorsal fin support may be developed either as a spine or as an articulate ray. The character, therefore, is of no generic, and probably of no specific, value.—S. F. H.

sexual characters, equally evident in mature males from Florida and from Bonaire. In specimens 22 mm. and upward in length these characters differentiate the sexes, and at the small size of 12 to 13 mm. the males already are distinguishable by their more prominent urogenital papilla, and by the larger and broader ocular cirri.

Peculiarities that distinguish the types of *Stathmonotus tekla* (22 and 23 mm. long), which I have examined, are artifacts. The fin formulas in both specimens are D. XL; A. 23; not all the characteristic cirri nor all the scales are missing; and the characteristic light blaze runs backward from behind eye. Examination of type material of *Histioclinus veliger* shows that in several respects the original description is incomplete or erroneous. The dorsal fin supports are spines, not articulated rays, and the scales in the figure are shown as very much smaller than they actually are. They are reduced anteriorly, and wanting on breast and axil of pectoral. The small teeth, present in an inner series near the symphysis in the upper jaw and on the vomer, escaped detection. Ten specimens from the type locality have D. XLI to XLIV; A. II,24 to 26; and 10 Tortugas specimens have D. XL to XLIV; A. II,24 or 25; P. 8; V. 2.

The number of eggs produced by a female is small, and they do not all mature together.

W. H. L.

The collection contains 6 specimens, 20 to 28 mm. long. The following proportions and enumerations are based on a specimen 23 mm. long to base of caudal, and on a paratype 19 mm. to base of caudal: Head 4.6, 4.75; depth 7.5, 6.5. Eye in head 5.0, 4.0; snout 4.5, 5.0; pectoral 4.2, 4.6. D. XLI, XLIV; A. II,24, II,26.

Dutch West Indies to Florida.

S. F. H.

Stathmonotus hemphillii Bean

Dr. Longley stated in his notes that he took 2 specimens in 5 to 6 fathoms. His collection contains these 2 specimens, 30 and 35 mm. long, and a third, 42 mm. long, without data, which is black in preservative and seems to have been dry.

Although the color of the Tortugas specimens does not fit the description of *Stathmonotus hemphillii* entirely, the fin-ray counts and proportions seem to be about right. On comparison of the specimens with the types (U. S. Nat. Mus. no. 37193), no differences in structure were noticed. The color seems to be variable.

The following proportions and enumerations are based on the 2 smaller specimens in the collection: Head 6.2, 6.5; depth 10.6, 12. Eye in head 4.9, 5.0; snout 5.6, 6.1; maxillary 3.0, 3.5; pectoral 5.6, 6.1. D. L, LI (LI in each of 2 type specimens); A. II,28, II,29 (II,26 and II,27 in types).

Dr. Longley has the following on color: "The coloration is evidently variable. One of the 2 specimens has much more fully developed than the type the white spots on the anal fin, matching those in the dorsal series. The other lacks the anterior two-thirds of the white markings which suggested the generic name."

Dr. Longley stated further, "The fish's motion is eel-like."

Known only from the Florida Keys.

S. F. H.

Blennius marmoreus Poey

?*Blennius fucorum* Cuvier and Valenciennes, Hist. nat. poiss., vol. 11, 1836, p. 263, pl. 324—249 miles south of the Azores.

Blennius marmoreus Poey, Enumeratio, 1875, p. 130—Cuba.

Blennius stearnsi Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 5, 1882 (1883), p. 300—Snapper Banks.

Blennius favosus Goode and Bean, Proc. U. S. Nat. Mus., vol. 5, 1882 (1883), p. 416—Garden Key, Florida.

*Blennius pilicornis*¹ Garman (not of Cuvier and Valenciennes), Bull. Lab. Nat. Sci. Univ. Iowa, vol. 4, 1896, p. 89—Tortugas, Florida.

This small bottom-haunting fish is sparsely but widely distributed at Tortugas where suitable cover occurs. Rocky tracts, especially if strewn with dead corals perforated by boring bivalves, are likely to harbor it, and it may be found where a single rock lies in sand, or a single coral head in turtle grass, if there is shelter beneath it. It was also seen among the exposed roots of *Thalassia* about the margins of sandy-bottomed holes, or among coral stacks, where it creeps by preference over their dead and caverned surfaces. Usually it finds its shelter ready made; but it may excavate and carry out sand with its mouth, or it may drive the sand out by lying close under a stone vibrating its body rapidly.

Below are entered the fin formulas of the types and cotypes of *Blennius favosus* and *B. stearnsi*. As will be observed, they are in general agreement. The range of variation in either group falls well within that of 26 Tortugas specimens presented for comparison. In other respects these types agree well with one another. Nothing more than differences in age, size, and sex, transitory differences in color or pattern, and the accidents of preservation distinguish them. *Blennius favosus*, then, seems clearly a synonym of *B. stearnsi*. Two type specimens of *B. favosus*, D. XII,18 or 19; A. II,20. Three type specimens of *B. stearnsi*, D. XI or XII,18 or 19; A. II,19 or 20. Twenty-six specimens of *B. marmoreus* from Tortugas, D. XI or XII,17 to 19; A. II,18 to 21.

To find in Poey's description of *Blennius marmoreus* justification for reducing *B. stearnsi* itself to synonymy is not simple. In *B. marmoreus* the depth is stated to go 5 times, the head 4.5 times in total length, and the eye 2 times in postorbital part of head. In a specimen of *B. stearnsi*, 61 mm. in total length, the corresponding measures are depth 5.0, head 4.3, eye 2.0, which is in close accord. The agreement is complete with respect to the location of the eyes near the profile and to each other; the profile falling steeply away before the eye; the presence of a single multifid superciliary tentacle; and the absence of all nuchal cirri. The trimness of the build, the small head, the yellow-brown color which is more intense on the upper half of the body, the marbled pattern with an abundance of closely approximated dark spots, the yellow fins, the form of the dorsal, all support the inference that the two are one. There is no mention of a nasal cirrus, nor of a semiocellate black spot on the dorsal, nor of other small dark spots on the fin. For these omissions the small size of the type specimen may afford an explanation, and also to some extent for the fin formula (D. XII,20; A. II,16), which departs decidedly from expectation.

¹ This name should have been written *Blennius filicornis*, and is so entered in the register in the Musée d'Histoire Naturelle.—W. H. L.

On this evidence, including an acquaintance with the habits of the species and some knowledge of the degree of accuracy with which Poey was working, it seems that *B. marmoreus* and *B. stearnsi* are identical.

Although *Blennius fucorum* has been reported from off New York, from Chesapeake Bay, and from Cooper's River, Charleston, South Carolina, specimens are not available for the confirmation of the correctness of the identifications. The type was discovered off the Azores in water from the pumps on a ship homeward bound from South America. That small fishes do make transatlantic passages among weeds and other growth on ships' hulls seems to be proved from specimens of two species of tropical American blennies which J. R. Norman showed me in London, that had been transported in that way to Copenhagen. The type of *B. fucorum* is a male, 62 mm. long; standard length 53 mm.; depth 14 mm.; head 13 mm.; eye 4.0 mm.; preorbital width 2.0 mm.; interorbital width 1.0 mm. D. XII,15; A. II,17, both fins free from caudal, their longest rays extending about to its base; P. 14, reaching the vertical of 1st anal spine; V. I,3, extending halfway to anus; anterior nostril with a slight trifid tentacle; ocular tentacle flattened, its base transverse, of the width of the superior opaque envelope of the eye on which it stands, with several minor branches at base, the main axis preponderant, reaching base of 2d dorsal spine. Color of body and fins brownish; dorsal with a dark area on anterior web, and about three rows of dark spots running obliquely down and back; soft dorsal nearly uniformly of the ground color of spinous part; anal unspotted, darker distally; back at dorsal base with about six dusky areas; eight or ten small dark spots along straight part of lateral line, and another series above, halfway between these and dorsal base; several more or less diffuse and irregular rows of spots crossing pectoral. The teeth are fixed and immovable, 26 small ones and a pair of great recurved, noncontinuous canines in upper jaw, and 24 with a similar contiguous pair on lower jaw. Although the color pattern is very like that of *B. marmoreus*, and the vertical fins have only a dorsal and an anal ray less than the least in the small numbers here dealt with, yet until more material is available the identity of *B. fucorum* and *B. marmoreus* must be left an open question.

This fish feeds largely on filamentous algae, and to a lesser extent on a variety of animals including small tunicates, clams, amphipods, bryozoans, bits of sponge, etc.

It is changeable in coloration, its shade varying with that of the substratum on which it occurs. It may appear in self-color in brownish olive, or in a striped pattern in which a brown line on light background passes through eye to base of caudal.

It has been known a long time that in some of the species of *Blennius* and its immediate allies there is a sexual difference in certain growths on the anal spines. In *B. marmoreus* these organs are evident in males of 45 mm. and upward in length. When they are fully developed they appear as 2 spherical or ellipsoidal fleshy bulbs, borne on the anal spines, and roughened with longitudinal rugae or lamellae. The female has no comparable structures. Her 1st anal spine is completely hidden by a flattened triangular fleshy shield of skin thickened at its margin.

In June the gonads of the males are small, but characteristically developed; those of the female have few or no visibly differentiated eggs. W. H. L.

The collection contains many specimens, ranging in length from 26 to 82 mm. The following proportions and enumerations are based on 2 specimens 51 and 82 mm. long: Head 3.8, 3.9; depth 4.3, 4.2. Eye in head 3.0, 4.0; snout 3.5, 4.2; maxillary 2.5, 2.1; pectoral 1.2, 1.3. D. XII,17, XIII,18; A. II,19, II,20; P. 14 (4 specimens counted).

Venezuela and West Indies to Florida.

S. F. H.

Blennius cristatus Linnaeus

Blennius cristatus Linnaeus, Syst. nat., 10th ed., 1758, p. 256—Indies (after Gronow).

Blennius microstomus Poey, Memorias, vol. 2, 1860, p. 288—Cuba.

Common toward the outer face of Bird Key reef, and the young have been taken along rocky shores of Loggerhead Key. Its pectorals are stronger than those of *Blennius marmoreus* and it leaps about much more actively.

The identification of *B. microstomus* with *B. cristatus* rests on Poey's description of the type, which is sufficient to show what fish he had. The fin formulas he gave (D. XII,15; A. I,17) correspond to those of Tortugas specimens of *B. cristatus* (D. XII,15 or 16; A. II,16 or 17), allowance being made for the fact that no blenny has normally a single anal spine. Poey either overlooked the hidden first spine of the female, or counted the 2d spine of the male as an articulated ray. The structure of the pectoral is the same in his type specimen and in *B. cristatus*; the coloration agrees; and due mention is made of the longitudinal series of filaments on the nape. Nothing is said regarding posterior canines, and indeed at the size attained by his type there is little to say, as these teeth are as yet not fully or not at all developed. W. H. L.

Although reported as common in certain places locally, only 6 specimens, 35 to 68 mm. long, are included in the collection. A series of cirri on the median ridge of the nape distinguishes this species from other blennies in the collection. The following proportions and enumerations are based on 2 specimens, 35 and 68 mm. long: Head 3.6, 3.8; depth 4.25, 4.0. Eye in head 2.7, 3.4; snout 4.3, 3.75; maxillary 2.6, 2.5; pectoral 1.13, 1.15. D. XII,15, XII,16; A. II,17, II,17; P. 14, 14.

S. F. H.

Hypleurochilus bermudensis Beebe and Tee-Van

(Plate 31, figure 1)

Hypleurochilus bermudensis Beebe and Tee-Van, Zoologica, vol. 13, 1933, p. 155, fig. 38—Marshall Island, Bermuda.

Not common, though several were sometimes found about a single one of the great *Orbicella* heads, to which it appeared to be confined. It is very active and not easy to catch, but may be trapped with a large test tube, or with a glass jar baited with a broken sea urchin. Empty, gaping bivalve shells seem to be attractive shelters. From one shell of *Spondylus* with one valve fixed to the roof of an

eroded coral, and the other still held cupped beneath it by the hinge ligament, 3 specimens were taken during the course of about a week.

In 6 Tortugas specimens the fin formulas are D. XII,12 or 13; A. II,14 or 15; V. 1,4. This accords with the original description, except for the ventral, which in the type is said to have only 3 rays; this was found to be correct for one fin, though the usual number of 4 is present in the other.

The sexes may be distinguished readily by their ocular cirri and teeth, and infallibly by their external genitalia. In either sex the cirrus is superior, transversely flattened, digitate, 3 to 5 times parted. In the female the elements are approximately equal and in length considerably less than half the eye. In the male one element is much longer than the others, exceeds the eye's diameter, and extends almost or quite to dorsal origin. Both have normally an enlarged, remote, recurved canine on either side in each jaw, which are much larger in the male. The type, a female, though correctly described, is abnormal in lacking lower posterior canines. The external genitalia in the male consist of rounded, rugose fleshy knobs on the anal spines, whereas the female has an expanded triangular fleshy shield in which the 1st anal spine is buried so deeply that only its tip shows as a slight papilla. See plate 31, figure 1.

The female in particular is changeable in coloration. In a white dish the median third only of her six broad, dark bars remains deeply brown. The upper and lower two-thirds become grayish olive with a finely reticulated pattern of pale blue about brassy dots, net and spots being most distinct on the head. The bars are separated by light saddles. By narrow lines these saddles connect with a similar series of ventral white marks. Occasionally the entire side of the body below the darkest lateral blotches turns nearly white. The male seems always darker than the female. Its first two light bands almost disappear in a black dish. On the Orbicellas the colors of both sexes are most vivid. Their dark and light bars contrast, and the olive on head and nape is enriched by yellow, simulating the hues of living and dead coral and thick shadows.

On June 13 the ovaries of a large female contained eggs so nearly mature as to indicate an early breeding season.

W. H. L.

The collection contains 9 specimens, 40 to 57 mm. long. The following proportions and enumerations are based on 3 specimens, 46, 53, and 57 mm. in length: Head 3.3, 3.3, 3.3; depth 3.4, 3.75, 3.8. Eye in head 3.0, 3.55, 4.0; snout 3.0, 3.5, 3.8; maxillary 2.5, 2.8, 3.0; pectoral 1.0, 1.0, 1.15. D. XII,13, XII,13, XIII,12; A. II,13, II,15, II,15; P. 13, 14, 14.

Bermuda and Tortugas.

S. F. H.

Salarichthys textilis (Quoy and Gaimard)

Salaris textilis Quoy and Gaimard, in Cuvier and Valenciennes, Hist. nat. poiss., vol. 11, 1836, p. 307—Ascension Island.

Entomacrodus nigricans Gill, Proc. Acad. Nat. Sci. Philadelphia, vol. 11, 1859, p. 168—Barbados.

Salaris margaritaceus Poey, Memorias, vol. 2, 1860, p. 289—Cuba.

Entomacrodus decoratus Poey, Repertorio, vol. 2, 1868, p. 398—Cuba.

Apparently rare at Tortugas. All I have seen were taken from *Lithodomus* burrows in eroded coral heads in the great northern shoal on Loggerhead reef.

According to Jordan and Evermann, the type of *Entomacrodus nigricans* was collected in Barbados by Theodore Gill. This fish seems to be registered in the U. S. National Museum as number 34625. Though the original description gives D. XI,15; A. 17, its fin formulas are D. XII,15; A. II,16½, which is perhaps the commonest combination for *Salarichthys textilis*. This type specimen seems at first to be a slighter fish than *S. textilis*, but the difference probably is due entirely to shrinkage. The tentacle on anterior nostril and a pair of small ones on nape are demonstrable, and a small supraocular tentacle appears to be branched.

Of characteristic color markings of *S. textilis* this specimen still shows a streak of blue down and forward from orbital margin to preorbital border, a distinct Y-shaped mark under lower jaw, three pairs of dark spots under soft dorsal, and bars on caudal. There is a transverse row of teeth on the vomer. Therefore, it is apparently impossible to maintain either genus or species.

Of *Salarias margaritaceus* there are 3 specimens (no. 12513) in the Museum of Comparative Zoölogy, which were sent by Poey. In fin formulas these differ slightly among themselves, showing D. XII,14 or 15; A. 15½ to 17½. None approaches the combination (A. I,14) which is said to have characterized the type. It is clearly by oversight that the species is denied nuchal tentacles. There are teeth on the vomer. These specimens, too, are normal examples of *S. textilis*, which Poey's description of the color markings of *S. margaritaceus* fits well.

Poey's *Entomacrodus decoratus* was based on a type 50 mm. long, which has apparently been lost. In the original account of its color there is nothing to distinguish it from *S. textilis*, and much to identify it with that species. There is no reason to believe that it lacked cirri on eye and nape. The fin formulas, except for an anal spine overlooked, have only 1 ray more in the dorsal fin than Poey's own specimens of *S. margaritaceus*. On such slight grounds it seems impossible to accord recognition to *E. decoratus*.
W. H. L.

The collection contains 5 specimens, 27 to 46 mm. long. The following proportions and enumerations are based on these specimens: Head 4.2 to 5.0; depth 5.0 to 6.0. Eye in head 3.0 to 3.75; maxillary 2.75 to 3.6; pectoral 1.0 to 1.1. D. XII,15 or 16; A. II,16 to 18; P. 13 or 14.

Bermuda, Florida, West Indies, Panama, and probably southward. S. F. H.

Rupiscartes atlanticus (Cuvier and Valenciennes)

(Plate 31, figure 2)

Salarias atlanticus Cuvier and Valenciennes, Hist. nat. poiss., vol. 11, 1836, p. 321—Atlantic Ocean.

Blennius truncatus Poey, Memorias, vol. 2, 1861, p. 424—Cuba.

Rupiscartes macclurei Silvester, Carnegie Inst. Wash. Year Book No. 14, 1915, p. 217—Guanica Harbor, Puerto Rico.

Alticus macclurei Silvester, Carnegie Inst. Wash. Pub. 252, 1918, p. 24, pl. 3, fig. 2.

Rupiscartes cubensis Mowbray, in Breder, Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 85, fig. 35—Cayman Pit, Cuba.

These fish frequent the greater coral stacks, but are sometimes found on gorgonian-covered rocky bottom. They "thread" concealed passages, slipping through quickly to stare from new ones, when driven from old vantage points. In haste they dart to cover head first, at leisure they may withdraw tail foremost.

Distinct from *Rupiscartes atlanticus* as *R. macclurei* appears when Silvester's colored plate is compared with the text of earlier descriptions, there seems to be no sound reason for regarding the two as distinct, as the figure only shows the young male in a color phase in which it was often seen.

Blennius truncatus Poey must also be included in the synonymy of *R. atlanticus* on the evidence of the original description. The vertical front, small mouth, fringed lips, 5-parted digitate tentacle at the border of the anterior nostril, the simple one above the eye, the 2 filiform ones on a common stalk on either side the nape, surely identify it. Reference to the truncate caudal with prominent angles (in the female), mention of 1 spine only in the anal fin—which is all one would see in that sex without dissection—the concordant details regarding bodily proportions, color, etc., support the inference.

This species differs notably in several respects from most of those assigned with it to the genus *Alticus*. The sperm ducts open separately in a pair of elevated points at the outer ventral margin on either side of the flattened urogenital papilla. In the female the 1st anal spine is shorter than the 2d and hidden, except for its tip, beneath a smooth, soft, triangular fleshy pad extending from the anus to the tip of the 2d spine. In the male the 2 anal spines bear each a conspicuous rugose growth, illustrated in plate 31, figure 2. These secondary sexual organs of the male are directly comparable with those of such related genera as *Blennius* and *Hypoleurochilus*, but are distinctive in shape and proportionately of much greater size. Nothing of the same general sort occurs in *Alticus*, even in the breeding season. It seems proper, therefore, to retain the name *Rupiscartes* for *atlanticus*, together with other species whose adult males may have similar organs.

In crevices and on the living coral over which the fish sometimes creep, both sexes are commonly of a dark greenish brown, with the lower lip, the dorsal fin above a line from its origin to the tip of the 20th fin support, the thickened tips of the lower pectoral rays, and the upper angle of the caudal red. In the male the median rays are longer and darker. On bare, white, eroded faces of the corals, or on the gray rocky bottom, they become paler brown over the fore part of the body, cream-colored posteriorly, with anal fin brown-bordered, or brown-bordered with base of chestnut in the males. In pails or aquaria they sometimes show a banded phase, which may be irregular, or a spotted pattern in waxy gray and chocolate.

The breeding season includes at least June and July. The eggs, guarded by males, were found in vacant burrows of *Lithodomus* in dead coral faces, and spread on the opposed bases of two palmate fronds of millepore coral standing in a cluster on the side of an *Orbicella* head. In two instances eggs in two stages of development were present, the younger in late cleavage or process of germ-ring formation, and the older with embryos near hatching. The deposition of the eggs is effected under tactile control, as the second lot is not extruded merely in

the same general region, but in contact with the first. The two may meet along a line 2 or more inches in length with no overlapping and no gaps between.

The eggs adhere to the substratum by a short tuft of chorionic filaments at the animal pole. They are flattened spheroids slightly distorted at the point of attachment, about 0.6 mm. in greater diameter, with a single large yellow oil globule one-quarter the diameter of the egg, which persists in almost undiminished size till the yolk sac is greatly reduced. W. H. L.

The collection contains 13 specimens, 65 to 110 mm. long. The following proportions and enumerations are based on 3 specimens, 65, 87, and 110 mm. long: Head 4.0, 4.4, 5.0; depth 4.15, 4.3, 4.5. Eye in head 3.4, 3.5, 3.9; maxillary 2.4, 2.5, 2.6; pectoral 0.9, 1.0, 1.2. D. XII,20, XII,20, XII,20; A. II,20, II,21, II,22; P. 15, 15, 15.

West Indies and Florida.

S. F. H.

Acanthemblemaria aspera (Longley)

Paremblemaria aspera Longley, Carnegie Inst. Wash. Year Book No. 26, 1927, p. 224—Tortugas, Florida.

Acanthemblemaria arborescens Beebe and Tee-Van, Zoologica, vol. 10, 1928, p. 244, with fig.—Port-au-Prince, Haiti.

Acanthemblemaria spinosa Longley (not of Metzelaar), Carnegie Inst. Wash. Year Book No. 30, 1931, p. 385.

Acanthemblemaria aspera Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 271, fig. 23.

Acanthemblemaria spinosa Metzelaar

Acanthemblemaria spinosa Metzelaar, Trop. atl. Vissch., 1919, p. 159, fig. 53—Curaçao.

?*Acanthemblemaria variegata* Beebe and Tee-Van, Zoologica, vol. 10, 1928, p. 247, with fig.—Port-au-Prince Bay, Haiti.

The variation in fin formulas in 10 of Beebe and Tee-Van's specimens of *Acanthemblemaria variegata* is: D. XX to XXII, 13 to 15; A. II, 21 to 24.

Though segregation of *A. spinosa* and *A. aspera* is impossible on fin formulas alone, the two nevertheless are quite distinct. The males are quite unlike. In color the males of *spinosa* are like their females and much like those of *aspera*. Their ocular cirri, though larger than those of females, are still relatively small and simple, and not entirely unbranched. Their crania have the many superior spines of their consorts rather than the few of *aspera*.

The description and figure show that the type of *Acanthemblemaria arborescens* obviously was a male. Beebe and Tee-Van (see citation above) were unaware of the sexual dimorphism in the species, as their 4 specimens were all males. Their type of *variegata* was a female, and in color like the females of *aspera*. As there was no significant difference in the fin formulas, and as the two species were taken in close proximity to each other, and on the same day, I mistakenly considered them a single species. The evidence, however, was entirely circumstantial and the error inexcusable. Yet *variegata*, when *spinosa* is better known (and I have examined the types of both), will probably prove to be a

synonym. Of Metzelaar's species only 2 specimens are known, both from Curaçao, both in Amsterdam. Both have the highly spinose occiput as in *variegata*; both have the fin formulas D. XXI,14; A. II,23; and in both the orbital cirri are small. The supposed differences in dentition between *variegata* and *spinosa* constitute an oversight by Metzelaar, as in the type of *spinosa* there are smaller teeth in either jaw in an anterior patch within the outer row, and the vomer and palatines are dentate as he stated. The color pattern is less contrastive than in Haitian material, but related species are so highly changeable that one must accept this with hesitation as evidence of specific difference. W. H. L.

No specimens were found in the collection in good enough condition to identify positively as this species.

Dutch West Indies, Haiti, and Tortugas, Florida.

S. F. H.

Emblemariopsis Longley

Emblemariopsis Longley, Carnegie Inst. Wash. Year Book No. 26, 1927, p. 222 (*E. diaphana* Longley). Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 269.

Emblemariopsis diaphana Longley

Emblemariopsis diaphana Longley, Carnegie Inst. Wash. Year Book No. 26, 1927, p. 223—Tortugas, Florida. Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 269, pl. 1, fig. 1.

Emlemaria pandionis Evermann and Marsh

Widely distributed at Tortugas, ranging outward from little below low water. During its breeding season, at least, it is found most abundantly on clean gravelly bottom littered with coral fragments bored by *Lithodomus*, or otherwise prepared to shelter it. A dozen or more of the fish may sometimes be found within a radius of 4 or 5 yards.

The type and only specimen known to Evermann and Marsh (Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 318, fig. 104) is a female. This fish has D. XX,15; A. II,23; V. I,3, though the original description gave D. XVII,18; A. II,23; V. I,2. Teeth on vomer weak, strong ones in a single series on palatines; dorsal and anal fins connected with caudal peduncle by a membrane reaching base of the reduced rays.

In 20 Tortugas specimens the dorsal fin has XX to XXII,15 to 17 rays, and the anal rays vary from II,22 to 24, the commonest fin formulas being D. XXI,16; A. II,23.

The sexual dimorphism is distinct. The male attains a larger size than the female, and the web of the ventral fin, behind the 2d ray in particular, is very much broader, the fin being foliaceous rather than doubly filar as in the female. The dorsal fin in the male also is much the greater, with its 1st spine when depressed reaching the base of the 13th, but in the female only the base of the 7th. The male's ocular cirrus reaches beyond end of snout, and the female's scarcely to posterior nostril. There is a great difference also in the structures about the vent, as in the male the skin is plaited, the folds simple and only half as high as

wide, and the urogenital papilla is conical and distinctly free from the anal rugae; whereas in the female there are about 12 folds, that is, several more than in the male, radially disposed, and emarginate at the ventral border, surrounding the vent with a brush of fleshy processes in two concentric rows of about a dozen each. Just between and behind the posterior members of this series of processes is the genital or urogenital opening, with 2 additional conspicuous papillae standing just behind it in a transverse plane.

The coloration in both sexes is highly changeable. It is usually very dark, and may be nearly black in the male if it is partly under cover. But on bare gray bottom, they may become very pale with only a faint mottling of darker color, with the vertebral axis, with evident patches of pigment on it, visible through the transparent tissues. In intermediate phases the head is mottled, the ground color of the body flecked with light and dark spots; with an irregular light patch under the anterior dorsal spines extending on the opercle, and nine light dorsal saddles equally spaced and growing lighter posteriorly. The dorsal fin is light in color to the 8th spine in the female, and to the 15th or so in the male, being marked in both sexes with four or five parallel dark lines, running down and back from its anterior border, and transparent and colorless posteriorly except for minute white points.

The breeding season includes at least June and July, but perhaps not much later, as on August 10 I no longer found the breeding fish on bottom they had earlier occupied. During that season the females are often seen in the open in their lightest bottom-matching colors and patterns, but the males are in their dark colors and stay much more at home, many of them having eggs in their care. In one instance about 250 eggs were found on the wall in a clam-boring in a piece of coral the size of a baseball. These eggs included at least two stages of development. Repeated visits of the female were noticed. The eggs are grayish in color, and 0.75 to 0.80 mm. in diameter.

From time to time a male guarding eggs thrusts out his body till the dorsal fin is largely free and then elevates and depresses it rapidly. He may even come wholly out and, "standing" vertically in the water a few inches up, go through the same motions. The plunger-like thrust of the body entering the burrow seems to change the water very well. The males were removed from two nests. The eggs in one disappeared by hatching, or otherwise, within 12 hours, and in the other nest they were still developing normally. Therefore the fishes' actions may not be significant. If a small fish comes near the male while he is guarding eggs, he may move out a little, elevate his great fin, and "stand" fast. If the intruder does not move away, he may proceed next to wigwag and finally dash at him. Mantis shrimps, which hunt such burrows as this blenny holds, greatly provoke him.

W. H. L.

The collection contains 20 specimens, 27 to 50 mm. long. The following proportions and enumerations are based on the largest specimen: Head 3.6; depth 5.75. Eye in head 5.7; snout 6.0; pectoral 1.75. D. XXII,16; A. II,24; P. 13.

Puerto Rico and Tortugas, Florida.

S. F. H.

Hemiemblemaria Longley and Hildebrand

Hemiemblemaria Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 273.

Hemiemblemaria simulus Longley and Hildebrand

Hemiemblemaria simulus Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 273, pl. 1, figs. 2a, 2b—Tortugas, Florida.

Chaenopsis ocellatus Poey

This genus appears to have been known from the West Indian region, till the present, only through the type of *Chaenopsis ocellatus*, a male about 125 mm. in length. Its fin formulas are D. XIX₃₄; A. II₃₅; P. 13, that is, a dorsal spine and a pectoral ray more, 4 dorsal and 3 anal rays less than indicated in the original description; ventrals with 1 weak spine with a filamentous tip, and 3 rays, the 3d very slight.

More than 30 specimens have been available for study. In 7 individuals examined, the dorsal fin has 52 to 54 supports, the anal 36 to 38, so in total number the Cuban specimen falls within the limits of the Florida material.

Florida fish of both sexes are mature at as small a length as 75 mm., and none as large as the Cuban specimen has been obtained, but all belong, I think, to the same species.

Males and females are readily distinguishable, as in the latter the anus is surrounded by a series of papillae wanting in the male, in which the dorsal fin is somewhat higher anteriorly than in the other sex.

This fish occurs commonly on bottom covered by sand or fine gravel. Hidden tubes of sand grains cemented together by a transparent, elastic, glairy substance, which has the appearance of having been recently secreted by the fish, house almost all. These tubes are nearly vertical and in them the fish rest, sometimes with bodies protruding for nearly half their length.

The species is changeable in shade. In the dark phase, to which the adult males most strongly incline, the dorsal surface is light-colored, the sides olive, growing lighter toward the belly. The gray dorsal surface is finely flecked with dark color, and at regular intervals these spots are ordered in transverse series, forming some twelve hairlines across the back. In paler phases the most notable difference is the lightening of the ventral color. With the exception of the dorsal and anal, the fins are transparent; a dark spot between the first 2 spines of dorsal, at the most semiocellated; the fin otherwise plain and dusky anteriorly, but growing paler and faintly barred behind; anal with a submarginal dusky line throughout its length.

The eggs are deposited in the tubes in which the fish live. The single lot discovered was found on June 12. The eggs are oblate spheroids, 0.95 mm. in diameter and three-fifths as much from pole to pole. The tube with the eggs was occupied by a female with functional ovaries. This is the only instance in which I have found a female of any species of fish guarding or seeming to guard her eggs.

W. H. L.

The collection contains 17 specimens, 46 to 90 mm. long. The following proportions and enumerations are based on a specimen 64 mm. long: Head 4.0; depth 17.2. Eye in head 7.9; snout 3.75. D. 54; A. 36; P. 13.

West Indies and Florida.

S. F. H.

Family MICRODESMIDAE

Microdesmus Günther, 1864

A change in the family and generic names, as used by Dr. Longley in his manuscript and by others in various published works, has become necessary because of Earl D. Reid's "Revision of the fishes of the family Microdesmidae, with description of a new species" (Proc. U. S. Nat. Mus., vol. 84, 1936, pp. 55-72, figs. 9-12 and pl. 2), wherein he has shown that *Cerdale* is a synonym of *Microdesmus*. This discovery necessitated a change in the name of the family from Cerdalidae to Microdesmidae.

S. F. H.

Microdesmus floridanus (Longley)

Cerdale floridanus Longley, Carnegie Inst. Wash. Year Book No. 33, 1934, p. 258—Tortugas, Florida.

Microdesmus floridanus Reid, Proc. U. S. Nat. Mus., vol. 84, 1936, p. 60, figs. 9a, 10b; pl. 2, fig. 2. Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 275, fig. 24.

Family BROTULIDAE

Brotula barbata (Bloch and Schneider)

The single specimen taken was secured in 89 to 155 fathoms.¹

In amplification of current descriptions it may be noted that the brown color is not quite uniform. It is freckled over the back with inconspicuous darker spots, about 2 mm. in diameter in our specimen of 365 mm. The ventral fin is not a filament of 1 ray, or a single bifid ray, as stated in some current descriptions, but is composed of 3 rays, of which the outermost is small and demonstrable only by dissection.

The pyloric caeca are short, sometimes as many as 3 present. The air bladder is rather unusual in construction, its wall being thick and ending behind in a cylindrical extension. This median structure has the diameter of a lead pencil in the fish dissected, and is about 15 mm. in length. It is closed at the end by a thin and elastic membrane, very unlike the opaque leathery body of the organ in texture. When the handle of a dissecting needle is thrust from within the bladder into this blind ending, piston-wise, the compressed air pushes the thin end before it to form a rounded vesicle. The device seems to be a safety valve of a sort, to relieve the internal pressure whenever a quick excursion to higher levels would endanger the inelastic walls of the bladder.

W. H. L.

¹ Dr. Longley has a note on a second specimen, 325 mm. long, taken south of Tortugas in 60 fathoms, which apparently was not saved.—S. F. H.

The larger specimen secured, which now is 350 mm. long, is the basis for the following proportions and enumerations: Head in total length 4.8; depth 6.35. Eye in head 5.2; snout 4.3; interorbital 5.5; maxillary 2.0; pectoral 2.0. D. about 80; A. about 70, both confluent with the caudal; scales very small, about 220; gill rakers 3, and several rudiments. The color in alcohol remains brownish, as in life, and the vertical fins have black margins.

West Indies to Florida.

S. F. H.

Dinematichthys Bleeker

Dinematichthys Bleeker, *Natuurk. Tijdschr. Ned. Ind.*, vol. 8, 1855, p. 318 (*D. iluocoeteoides* Bleeker).

Ogilbia Jordan and Evermann, in Evermann and Kendall, *Bull. U. S. Fish Comm.*, vol. 17, 1897 (1898), p. 132 (*O. cayorum* Evermann and Kendall).

Because characteristic male organs were wanting in the type of a new species of fish from Key West, on which the investigators made no determination of maleness; because it had fewer fin rays than East Indian *Dinematichthys*; and perhaps because *Brosomphycis ventralis* Gill, of the west coast of Mexico, had much the same number of fin rays as the Atlantic form and like it seemed to lack "claspers," Jordan and Evermann erected the genus *Ogilbia* to receive the two. But both *Ogilbia cayorum* Evermann and Kendall and *O. ventralis* (Gill) are sexually dimorphic. In none save minute details do the genitalia of their males differ from those of males of *D. iluocoeteoides* (Brit. Mus. no. 62.2.28.65, Bleeker's collection). Until additional generic differences are found, or its segregation on differences in fin formulas alone is approved, *Ogilbia* may be referred to synonymy.

W. H. L.

Dinematichthys cayorum (Evermann and Kendall)

Ogilbia cayorum Evermann and Kendall, *Bull. U. S. Fish Comm.*, vol. 17, 1897 (1898), p. 133, pl. 9, fig. 14—Key West, Florida.

Brosomphycis verrillii Garman, *Trans. Connecticut Acad. Sci.*, vol. 10, 1900, p. 511—Bailey Bay, Bermuda.

This species is rare in museums, but may be found at Tortugas without difficulty under dead corals in tide pools, or near low-water mark, on Bird Key reef, though by no means limited to that locality.

In 6 specimens the dorsal fin supports varied from 69 to 72, the anal from 52 to 55. Evermann and Kendall misconceived the structure of the ventral fin, as the 2 rays mentioned by them include both fins, which are close together and thread-like.

It is viviparous, the breeding season including the latter part of June, with limits unknown. Females at 50 mm. are capable of bearing young, and on several occasions gave birth to broods of 3 to 5 while on the way to the laboratory from Fort Jefferson moat or Bird Key reef in the collectors' pails.

The young are hardy, of a length of 15 mm., swimming about actively from the first with the parent, or hiding with her or with other adults beneath pebbles. Their bodies are transparent and colorless, except for a broad dusky stripe on the

side. Adults are gallstone yellow above, lighter below, with darker punctulations but no outstanding markings.

The sexes differ profoundly in their genitalia. The genital aperture in the female is flanked on either side by a slight papilla. The male has a long intromittent organ protrusible under pressure. This is flanked on either side by a pair of spatulate plates, convex on the outer face and concave within. Medial to each is a second plate with an anterior and a posterior lobe, of which the former is the broader and stouter. No part of the mechanism is spinose, and it is a misnomer, I think, to call any of the plates claspers. From the position they assume when turned far forward, their function seems that of copulatory guides.

I have not seen the type of *Brosomphycis verrillii*, but have examined 4 specimens of *D. cayorum* from Bermuda. For the 4 the dorsal rays are 69, 71, 72, and 73, the corresponding anal rays 52, 49, 55, and 54, suggesting a range of variation like that in material from Florida.

The fin formulas given by Garman (see citation above) for *verrillii* (D. 70; A. 50) are not distinctive. The streaked color pattern he mentions is satisfactorily explained by bands of connective tissue showing through rather slightly pigmented skin.

W. H. L.

The collection contains many specimens, ranging from recently born young, about 10 mm. long, to adults, 46 mm. long.

Florida and Bermuda.

S. F. H.

Dicromita agassizii Goode and Bean

The collection contains 4 specimens, about 69 mm. (caudal broken) to 150 mm. long, without locality label or identification tag. No field notes that seem to refer to this species were found. It may perhaps be assumed that they were taken in deep water south of Tortugas.

The specimens have been compared with 1 of the 2 type specimens (from the Gulf of Mexico), on which the only description and figure known to the writer were based. It is possible to make a few additions and corrections to the original description and drawing. First, the body tapers more gradually posteriorly than Goode and Bean's artist indicated, both in the type and in the Tortugas material. Second, the caudal fin is much longer and more distinct than shown. "Vertical fins confluent" seems to be approximately true of the dorsal and caudal, but scarcely of the anal. Even now the exact situation is not clear because the membranes are broken. Third, the original description mentions "three or four spines upon preoperculum," whereas the artist has correctly indicated 2 flat points. The only other spine on the head is the rather large and sharp one near upper angle of opercle. Fourth, I cannot be certain from any of the 5 specimens before me that a lateral line actually is present. Each fish has four longitudinal grooves along the side anteriorly. The second from above is situated where the lateral line might be expected to lie, and it ends in advance of the other grooves. It seems probable that Goode and Bean considered this groove a lateral line, or thought that the lateral line lay in it. Fifth, the head is quite fully scaled, only the margins of the jaws being naked. Certainly it is as fully scaled as in *Neobythites*. There-

fore, it is misleading to say "head partly naked" as Goode and Bean have done in their key.

The following proportions and enumerations are based on 3 specimens in the collection, 64, 110, and 140 mm. long to base of caudal: Head 4.9, 5.25, 5.0; depth 7.1, 5.8, 5.6; from snout to origin of dorsal 4.6, 4.3, 4.25; from snout to vent 2.9, 2.6, 2.8. Eye in head 4.7, 3.8, 4.75; snout 4.0, 4.4, 4.75; maxillary 1.7, 1.75, 1.75; pectoral damaged, about 2.0. D. about 100; A. about 85; scales between upper angle of gill opening and vertical from origin of anal about 40; gill rakers 24; branchiostegals 8.

The color of the preserved specimens is uniform brownish.

The compressed head and body; lateral eyes; fully scaled head; large mouth, with maxillary extending beyond posterior margin of eye; bands of villiform teeth on the jaws, vomer, and palatines; and small ventral, inserted on the isthmus, and composed of a single simple filament are useful in characterizing the genus and species.

West Indies and Gulf of Mexico, in deep water.

S. F. H.

***Diplacanthopoma brachysoma* Günther**

Dr. Longley listed this species in his field data at least four times, from depths of 205 to 392 fathoms. As many as 10 specimens are listed from four hauls, 7 having been taken in a single haul at 290 fathoms. The fish ranged in length from 106 to 200 mm.

The collection contains 7 specimens, 90 to 200 mm. long.

Body compressed, tapering gradually into a slender pointed tail, notably longer than head and trunk; head almost flat above, about as wide as deep at posterior rim of orbit; bones about eyes and snout quite cavernous; eye placed high, slightly supralateral, a little longer than the short, broad snout; mouth broad and oblique, with a broad maxillary reaching opposite posterior margin of eye; teeth all small, villiform, in bands on jaws, vomer, and palatines; gill rakers short and spinulate; opercle with 2 strong spines, one vertical, the other horizontal, forming a right angle between them; snout bearing a very short, compressed median spine situated about opposite anterior margins of orbits; scales small, cycloid, longer than deep along side, and missing on head; dorsal and anal fins of about equal height and fully confluent with caudal, the origin of dorsal scarcely an eye's diameter behind vertical from base of pectoral; pectoral moderately long, but failing to reach vent; each ventral consisting of a mere filament, enclosing 2 rays inserted close together and about an eye's diameter in advance of pectorals.

The following proportions and enumerations are based on 3 specimens, 158, 178, and 200 mm. long: Head in total length, 5.0, 4.7, 4.8; depth 8.0, 7.1, 10.0; distance from snout to vent 2.5, 2.25, 2.4; snout to origin of dorsal 4.0, 3.9, 3.8. Eye in head 4.25, 4.5, 4.8; snout 5.5, 4.75, 5.7; maxillary 2.0, 2.0, 2.1; pectoral 2.0, 1.8, 1.5. Scales between upper anterior angle of gill opening and vertical from origin of anal about 48; P. 21, 22, 23; gill rakers 12, 13, 13.

Sexual dimorphism is very strong, the genitalia apparently being similar to those of *Dinematichthys cayorum* (see p. 278).

Dr. Longley has the following on color: "Faintly brown above, almost white

on belly. Two faint dark brown streaks, of width of pupil, on side from upper margin of gill opening and from behind pectoral, fading into the general ground color on the tail." No trace of dark streaks remains in the preserved specimens, the color being uniformly grayish or yellowish, variable among specimens; only the margins of the dorsal and anal are dark posteriorly.

The foregoing rather long description is offered because the literature seems to contain only the original, based on a specimen 112 mm. long. The species apparently was previously reported only from deep water off Brazil. S. F. H.

***Neobythites gillii* Goode and Bean**

The collection contains a single specimen, 85 mm. long. Dr. Longley listed only 1 specimen in his field data, taken in 55 fathoms, which probably is the one at hand.

Head and body compressed, the tail tapering gradually; eye moderate, longer than the round, projecting snout; mouth large, slightly oblique; maxillary reaching well beyond eye; upper posterior angle of opercle with a sharp spine, preopercle with a few hidden points; head and body covered with small scales, not embedded on sides. Vertical fins confluent; caudal well exerted; dorsal origin a little behind vertical from base of pectoral; pectorals not quite reaching opposite vent; ventrals inserted on isthmus, each composed of 2 filaments, failing to reach vent by diameter of eye.

The following enumerations and proportions are based on the specimen in hand: Head 4.2; depth 5.0; snout to origin of dorsal 3.8; snout to vent 2.5. Eye in head 3.75; snout 6.4; maxillary 2.1; pectoral 1.8; longest ventral filament 1.4. D. about 97; A. about 80; scales about 105, between upper angle of gill opening and origin of dorsal 28; gill rakers 10.

Dr. Longley described the color as silvery on sides and back with two large black spots and with rings. That description holds for the preserved specimen, though it may be added that the back is brownish, with darker brown markings, some of which at least form partial rings, and that in addition to the two black spots mentioned there is a third small one at and on the base of the dorsal posteriorly. The snout, lower surface of head, chest, and bases of ventrals and pectorals bear black punctulations.

Brazil to Gulf of Mexico, in deep water.

S. F. H.

***Barathronus bicolor* Goode and Bean**

A single specimen, 120 mm. long, bearing tin tag number 62, is included in the collection. Though the key to this tag number has not been found, numbers 60 and 61 are flatfishes, taken south of Tortugas in 168 fathoms. Number 63, a specimen of lizard fish, is either from the same haul or from another one in 295 to 315 fathoms. There can be little doubt that the specimen of *Barathronus bicolor* is from one of the two hauls mentioned.

The following proportions and enumerations are based on the specimen at hand: Head 5.3; depth 6.6; distance from tip of snout to origin of dorsal 2.2. Eye

in head 3.8; snout 5.1; interorbital 8.0; maxillary 1.75; pectoral 1.35. D. about 60; A. about 45, the rays being enveloped in skin and difficult to enumerate; P. 20; gill rakers long and slender, 25 on lower limb of first arch.

The body is compressed, and narrower than head; eyes covered with skin, making them almost invisible in the alcoholic specimen; snout very short; mouth almost vertical; teeth in the jaws minute, with the exception of several somewhat enlarged ones posteriorly in the lower jaw; vomer with 3 large, fanglike teeth, 1 on one side and 2 on the other, precisely as described in the type.

The color in alcohol is light grayish to brown; dorsal and anal dark brown; other fins pale; mandible dusky; an indication of a dusky horizontal stripe extending behind pectoral, to a little beyond vertical from origin of anal, and another darker band extending from base of ventrals to vent.

This species apparently has not been reported heretofore from United States waters. Deep water in the West Indies to Florida.

S. F. H.

Family OPHIDIIDAE

Lepophidium cervinum Goode and Bean

A single specimen, 216 mm. long, was taken in 60 fathoms, south of Tortugas.

W. H. L.

This specimen was not found in the collection.

Gulf Stream.

S. F. H.

Lepophidium profundorum Gill

This record is based on a scrap, 60 mm. long, from waste of the tern rookery on Long Key. This dried fragment comprises the head from the tip of the snout to the base of the 14th dorsal ray. Although it has suffered much from digestion, the ventral fins remain, which are no more than a pair of bifid barbels, a third as long as the head, and inserted under the anterior margin of the eye; the anterior dorsal fin supports to the number mentioned articulate, as is indicated by their sharply truncate ends and by segments not dropped; the gill openings are wide; and one of the pectorals turned forward is inserted under the margin of the operculum. These peculiarities sufficiently indicate the family.

The generic and specific determination is more difficult, but I believe that the above identification is correct.

W. H. L.

The fragment was not found in the collection.

Gulf Stream, off Florida.

S. F. H.

***Lepophidium* sp.**

Specimen 25 mm. long, collected by W. L. Schmitt in 10 fathoms near White Shoal, in mud.

Ventrals each of 2 rays, inserted below middle of eye; dorsal and anal confluent with caudal; anal origin approximately under 12th dorsal spine; pectorals

reaching vent; length of head about half distance from tip of snout to vent; snout with a short concealed median spine, directed upward and forward before eye; mouth slightly inferior; lower jaw included; teeth small, in several series in upper jaw at least, outer ones apparently stronger, present on vomer; 7 short gill rakers on lower limb of anterior arch.

W. H. L.

This specimen was not found in the collection.

S. F. H.

Family CARAPIDAE

Carapus bermudensis (Jones)

Lefroyia bermudensis Jones, Zoologist, vol. 9, 1874, p. 3837—Bermuda.

Fierasfer affinis Gudger, Carnegie Inst. Wash. Pub. 391, 1929, p. 203—Tortugas, Florida.

The collection contains 5 specimens, 73 to 124 mm. long. In addition to these, Dr. Longley had placed 4 specimens in the U. S. National Museum, which are labeled *Fierasfer affinis*. This identification, however, is not in Dr. Longley's handwriting, and I find no statement among his notes showing that he definitely identified his specimens. Once he questioned their identity with *Carapus bermudensis*, but it seemed to him that the vertebrae (about 160, according to his count) were too numerous. All the specimens taken by Dr. Longley appear to have been removed from holothurians, as were those reported on by Gudger (see reference above).

The Atlantic species, reported from Bermuda, Florida, and the West Indies, if there be only one, has been called either *Fierasfer affinis* Günther, for which the type locality is unknown, or *Lefroyia bermudensis* Jones. It seems advisable to refer the Tortugas material to *bermudensis*, which definitely is from the Atlantic, at least until a more detailed study is made. In a rather hurried examination of Florida and West Indian specimens I have detected no specific differences. If a difference in vomerine teeth exists, as has been alleged, it is not present in the specimens examined. In all these the vomer has a median series of rather strong teeth, which is surrounded by much smaller ones.

The following proportions are based on 3 specimens from Tortugas, 77, 97, and 124 mm. long: Head in total length 8.6, 7.5, 8.8; depth 12.5, 11.75, 13.5. Eye in head 4.3, 4.0, 4.0; snout 5.0, 5.4, 5.4; maxillary 2.0, 2.0, 1.75; interorbital 5.6, 6.5, 5.2; pectoral 2.25, 2.0, 1.75.

It is virtually impossible to count fin rays accurately. Dr. Longley attempted it and has D. about 145; A. about 160, and for another specimen, D. about 184; A. 205. In a partly dissected specimen he evidently counted vertebrae, and apparently found "about 160."

The color of preserved specimens is pale, except for a silvery lateral band on anterior third to half the side, composed of silvery spots separated by muscular rings. Dr. Longley noticed an internal pattern in life consisting of "faint reddish bars, irregularly placed along trunk." He also found the peritoneum "patterned with black and silver, but solidly black dorsally."

West Indies, Bermuda, and Florida.

S. F. H.

Family BATRACHOIDIDAE. TOADFISHES

Porichthys Girard, 1854

For a revision of this and related genera the reader is referred to Hubbs and Schultz, Proc. U. S. Nat. Mus., vol. 86, 1939, pp. 473-496, fig. 57. S. F. H.

Porichthys porosissimus (Cuvier and Valenciennes)

Only 3 specimens were secured. One was taken in the 10-fathom channel east of Loggerhead banks, and the others in 35 to 40 fathoms south of Tortugas.

W. H. L.

Two specimens are included in the collection, 65 and 76 mm. long. The third one according to Dr. Longley was about 80 mm. long.

Atlantic coast of tropical America, ranging northward on the coast of the southern states.

S. F. H.

Family GOBIESOCIDAE. CLINGFISHES

When one tries to pick out a living clingfish from a bowl, it grips the glass with its sucking disk. When seines or trawls disturb it in nature it must do the same thing, for we caught specimens only when we brought up relatively large and stable objects, chiefly loggerhead sponges, to which we found them holding fast. For this reason collectors usually take them singly or in very small numbers, making opportunities for comparison limited. The fishes are prevailingly thick-skinned and secrete an abundant mucus which preserving fluids harden on their bodies and fins, obscuring fine structures. What species composed the group, as a result has not been easy to make out, but the number of names proposed much exceeds the number of species.

W. H. L.

Gobiesox Lacépède

Gobiesox Lacépède, Hist. nat. poiss., vol. 2, 1800, p. 595 (*G. cephalus* Lacépède).

Megaphalus Rafinesque, Anal. nat., 1815, p. 86 (substitute for *Gobiesox* Lacépède).

?*Sicyases* Müller and Troschel, in Müller, Weigmann's Arch. Naturgesch., Jahrg. 9, 1843, p. 298 (*S. sanguineus* Müller and Troschel).

Sicyogaster Brisout de Barneville, Rev. zool., 1846, p. 144 (*Gobiesox marmoratus* Jenyns).

Caularchus Gill, Proc. Acad. Nat. Sci. Philadelphia, vol. 14, 1862, p. 330 (*Lepadogaster maeandricus* Girard).

Only one species of *Gobiesox* is at present known from Tortugas. Because of the confused state of the record, however, its determination has necessitated examination of much the greater part of west Atlantic material at present in museum collections. None has the simple dentition supposed to distinguish the genus *Sicyases*.

The diagnostic features of *Caularchus* are said to be its long dorsal and anal fins, with an almost equal number of rays in each, and its numerous vertebrae. But the 13 to 15 dorsal rays of *C. maeandricus* do not exceed the 11 or 12 of *G. nigripinnis* by more than these do the 8 to 10 of *G. cephalus*; nor are its

dorsal and anal counts more nearly alike than those of *G. nudus*, which are almost invariably 8 and 7. The vertebrae in *C. maeandricus* are 32, in *G. mar-moratus* 29, in *G. nigripinnis* and *G. strumosus* 25, so that again the difference between *Caularchus* and *Gobiesox* is less than that between species of the last-mentioned genus.

W. H. L.

The foregoing is all that was found among Dr. Longley's manuscripts on this family and genus. Neither was any statement as to the diagnostic characters of the species studied found among his notes. However, in *Carnegie Institution of Washington Year Book* Nos. 33 (1934, pp. 270-272) and 34 (1935, pp. 283-284) he has presumably given a fairly complete synonymy. Herein (No. 33) he has indicated that he regarded *G. virgatulus* Jordan and Gilbert as a synonym of *G. strumosus* Cope. He recognized *G. punctulatus* (Poey) (same reference) as a valid species, and assigned to its synonymy *G. laeres* Jordan and Bollman. Therein he also recognized *Sicyases rubiginosus* Poey, to the synonymy of which he assigned *S. carneus* Poey. Then, in the next Year Book (No. 34) he substituted *Gobiesox* for *Sicyases* and also assigned *G. androsiensis* Rosén to the synonymy of *G. rubiginosus*. To the synonymy of *G. punctulatus* he added *G. vittatus* Metzelaar, and questionably *G. yuma* Nichols. Further, he recognized *G. nigripinnis* (Peters), and placed in its synonymy *G. gyrinus* Jordan and Evermann and *G. barbatulus* Starks. Finally, he recognized *G. cephalus* Lacépède and placed *G. tudes* in its synonymy.

S. F. H.

Gobiesox strumosus Cope

Gobiesox strumosus Cope, Proc. Acad. Nat. Sci. Philadelphia, vol. 22, 1870, p. 121—Hilton Head, South Carolina.

Gobiesox virgatulus Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 5, 1882 (1883), p. 293—Pensacola, Florida.

This fish was taken at Tortugas only when some relatively large objects, such as loggerhead sponges, were brought up from the bottom. The collection contains 9 specimens, ranging in length from 20 to 70 mm.

If Dr. Longley prepared an account of this species, it did not reach me. Neither do any of his specimens bear identification tags. Dr. Longley has stated in his discussion of the genus that he regarded all specimens from Tortugas as of one species. He used the name *virgatulus* in his field notes, but later referred this to the synonymy of *strumosus*. Accordingly, the last-mentioned name has been adopted here as being apparently the one he intended to use for Tortugas specimens.

The following proportions and enumerations are based on 5 specimens, 30 to 70 mm. long, in the Tortugas collection: Head to tip of opercular spine 2.2 to 2.6; width of head 2.3 to 2.5; depth 4.3 to 5.3. Eye in head 4.4 to 6.0; snout 2.8 to 3.6; interorbital 2.8 to 3.6; caudal peduncle 4.4 to 5.6; length of ventral disk 1.2 to 1.3; pectoral 2.5 to 3.2. D. 10 or 11; A. 8 or 9 (7 in one specimen); P. 21 to 23.

Among Dr. Longley's data I find the counts D. 11, 11, 10, 11, 10; A. 8, 9, 8, 8, 8; P. 21. Of the teeth he said, "Teeth in upper and lower jaw simple, in a single

series." To this I may add that the anterior teeth in the lower jaw in 3 large specimens examined are compressed, incisors, and decidedly broader than those opposite them in the upper jaw, which are scarcely compressed, the rest of the teeth being pointed.

Concerning the color Dr. Longley said, "Dark, nearly black, the margins of the dorsal and anal narrowly white; black streaks back of eye in largest specimen; disk pale." Elsewhere in his notes he said, "Quite pale; postocular fold rosy." In preserved specimens the color also varies from pale to nearly black. The caudal has a pale margin like the dorsal and anal.

Middle Atlantic states to Florida.

S. F. H.

Family TRIACANTHIDAE

Triacanthodes Bleeker

Triacanthodes Bleeker, Act. Soc. sci. Indo-Néerl., vol. 3, 1858, p. 37 (*Triacanthus anomalus* Schlegel).

Paratriacanthodes Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, 1934, p. 362 (*P. retrospinis* Fowler).

With the discovery of new species, *Paratriacanthodes* Fowler seems scarcely distinct from *Triacanthodes* Bleeker, with which it is here merged.

Triacanthodes anomalus (Schlegel), the genotype, in each jaw near the symphysis has a pair of teeth inside the main series. These are mentioned in the original description of the species and are well and symmetrically developed in 3 Japanese specimens examined. Of 19 specimens of *T. aethiops* Alcock, from the Philippines, 7 have a complete complement of supplementary teeth, 2 lack a single tooth, 2 have a lower pair only, 3 have a single lower tooth, 1 a single upper, and 4 none at all. The type of *Paratriacanthodes retrospinis* has a single supernumerary tooth in the lower jaw; 3 other specimens have none. The type of *P. herrei* Myers (Smithsonian Misc. Coll., vol. 91, no. 9, 1934, p. 9) and 2 other specimens also have none. There appears, therefore, to be intergradation between the two genera in regard to dentition.

In addition to its strong spine, the ventral fin in *T. anomalus* and *T. aethiops* has 2 rays, the homologues of which *P. retrospinis* and *P. herrei* show at least at times in a reduced state. In *T. lineatus* the 2 are present, the 2d adnate to the side. An accessory pair of teeth is usually present in each jaw. The gill opening and pseudobranchiae are limited ventrally as in the two species of *Paratriacanthodes*.

W. H. L.

Triacanthodes lineatus Longley

Triacanthodes lineatus Longley, Carnegie Inst. Wash. Year Book No. 34, 1935, p. 88—Tortugas, Florida, Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 276, fig. 25.

Triacanthodes zebra Nichols and Firth, Amer. Mus. Nov., No. 883, 1936, p. 2, fig. 1—off Cape Henry, Virginia.

Family BALISTIDAE. TRIGGERFISHES

Balistes capriscus Gmelin. LEATHERJACKET

Balistes carolinensis Gmelin, Syst. nat., vol. 1, 1788, p. 1468—Carolinas.

*Balistes capriscus*¹ Gmelin, *ibid.*, p. 1471—Indian and American oceans (after Gronow).

Balistes powelli Cope, Proc. Acad. Nat. Sci. Philadelphia, 1870, p. 120—Newport, Rhode Island.

Balistes moribundus Cope, Trans. Amer. Philos. Soc., vol. 14, 1871, p. 479—St.-Martin, West Indies.

Balistes forcipatus Jordan and Evermann (part not of Gmelin), Bull. U. S. Nat. Mus., No. 47, pt. 2, 1898, p. 1702.

Adults have been noticed rarely, and only about the greatest shoal toward the upper end of Loggerhead bank. The young, to 100 mm. in length, are common in floating *Sargassum* and about bits of waste in the drift. Some young were observed accompanying a piece of bamboo, in the hollow of which they hid when alarmed.

Grown fish observed from below, swimming high in the water, were largely gray and inconspicuous, but the species, according to Townsend (13th Ann. Rept. New York Zool. Soc., 1909, p. 26), is highly changeable in coloration. Some of its phases are well shown by the young. In the *Sargassum* these are clouded yellow-olive finely marbled and spotted with light blue points, some of which appear even on the iris. In aquarium tanks by day they are almost black, but by night they are black and gray, the darker areas being the same as in the clouded olive phase. The first dark shade is under the spinous dorsal; two under the soft dorsal, and a band across the caudal peduncle, and in some specimens a blotch at base of caudal.

The variation in fin supports in a sample of 21 from several localities is, D. III,27 to 29; A. 23 to 26. The commonest combination is D. III,27; A. 24. This, and not D. III,26; A. 22, as is stated in the original description, is the fin formula of the type of *Balistes powelli*. That of *B. moribundus* is correctly recorded as D. III,29; A. 26. It is less representative than the other, but occurs twice in a small sample of 21 specimens.

Something of the color pattern remains in the type specimens mentioned in the preceding paragraph to affiliate them with *B. capriscus*. In the smaller one (*moribundus*) the spinules on the scales are fewer than in the larger one (*powelli*) and the spinule at the anterior margin of the scale more conspicuously exceeds the others in height and strength; but at the same sizes the same difference appears in *B. capriscus*, with which there can be no doubt these are identical.

Apart from Cope's specimens, as viewed by Jordan and Evermann, I have noticed no record on which the occurrence of *Balistes forcipatus* in the West Indies and northward may be postulated. Of a *scaleless* groove "before the eye below the nostril," as Jordan and Evermann have it in their description of the genus *Balistes*, I find no trace in *B. capriscus* or in *B. vetula*. W. H. L.

The collection contains many specimens ranging in length from 30 to 90 mm., and 1 of 265 mm.

¹ This name was preferred by the first reviser.—W. H. L.

In 10 specimens from Tortugas the soft rays in the dorsal vary from 27 to 28, and in the anal from 24 to 26.

The dark shades or blotches along the back, described in living or fresh specimens, remain in the preserved material, and are present even in the smallest specimens at hand. The forked or V-shaped one under the anterior part of the soft dorsal is the most prominent, and forms a ready recognition mark. Some, but not all, of the young have greenish or pale spots along the back, which more usually are present and more distinct on the posterior parts of the soft dorsal and on the anal.

The following account of the structure and operation of the peculiar spinous dorsal of *B. capriscus* was prepared partly from Dr. Longley's notes and partly from whole and dissected specimens in hand.

The spinous dorsal of this and related species is a mechanism so widely appreciated in its operations that the generic names *Balistes* and *Balistapus* and the common name "triggerfish" have all been suggested by it.

The hard parts of this mechanism consist of 3 spines and a bone which forms a trough. The spines are set in this trough, beneath which their basal elements project. The 1st spine, near its base, is attached to the head in advance of it by a pair of strong muscles lying on each side of an occipital crest and extending forward well beyond the eyes. These muscles obviously are the erectors of the fin. Next, the 2d spine is bound to the 1st by several strands of connective tissue that extend from well above the base of the 2d more or less horizontally to the deep posterior groove of the 1st spine. Finally, the 3d spine is bound to the 2d by a single strong strand of connective tissue that reaches from near mid-length of the 3d spine to near the base of the 2d. In small specimens, at least, the strands of connective tissue between the spines generally can be seen lying within the interradi al membranes. Because the 2d and 3d spines are bound to the 1st, they must follow the 1st when it is erected.

The locking of the spines occurs when they are erected, as the 2d spine is drawn forward, and the slight knob on the anterior margin of its base slips into the deep posterior groove of the 1st spine, which with its edges is bent forward rather sharply near the base of this spine. In other words, when the 1st spine is erected the base of the 2d spine is drawn forward into a space partly under the base of the 1st. The basal knob fits into the base of the groove of the 1st spine so snugly that it "locks" it securely. The 1st and 2d spines, then, cannot be deflexed until the base of the 2d is drawn backward, and out of the partial socket under the 1st. As the 3d spine is attached to the base of the 2d by a strand of connective tissue, the base of the 2d slides backward quickly if the 3d spine is deflexed. Therefore, the 3d spine forms the "trigger," making it impossible to unlock the other 2 spines without depressing the 3d.¹

Both coasts of tropical America; entire Atlantic coast of the United States and southward.

S. F. H.

¹ Since the above was written, an article by Charles R. Clothier (Calif. Fish and Game, vol. 25, no. 3, 1939, pp. 233-236, figs. 86-89) describing the bony structure of the locking mechanism of the Pacific triggerfish, *Capriscus polylepis*, has appeared. This mechanism seems to be virtually identical in the two species in which it has been studied.—S. F. H.

Balistes vetula Linnaeus. QUEEN TRIGGERFISH

(Plate 33, figure 1)

This fish is rare in shallow water during the summer months, although Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 249) reported it as being often taken at Tortugas by Cuban fishing smacks.

In its commonest color phase it is olive green posterodorsally, becoming golden yellow on throat and breast, with a light blue line bordering each lip posteriorly, joining behind angle of mouth a broad line of the same color extending to a point beneath gill opening; a second broader line of the same color above concurrent with the first, extending from snout to base of pectoral, where it curves broadly downward; caudal peduncle encircled by a broad band of somewhat lighter blue; dorsal, anal, and caudal fins more or less conspicuously marked with blue; base of anal and sides just above it with a coarse network of darker blue; a series of broken brown lines, usually separated by three rows of scales, sloping downward and backward from bases of dorsal fins over postero-dorsal quarter of body; a system of blue-black lines or dots, narrowly margined with yellow, about eye.

Fish resting in a tank frequently showed a blotched phase in which light areas behind the eye and pectoral fin, and below the interspace between the dorsal fins, may foreshadow such a banded phase as appears in *Balistes capriscus*. If one's hand be placed on the fish, all the green and gold of its ground color is replaced by pale gray. The brown stripes of its posterodorsal region disappear, and the lines about the eye become pale blue narrowly margined by greenish yellow. On alga-covered bottom in its richly colored phase it seemed most aptly to repeat the color of its surroundings. A fish in grayer setting among massive dead and broken or eroded corals was clouded or blotched and lacked its brighter hues. Another was very pale when swimming in the open over white bottom.

W. H. L.

The collection contains only 2 specimens, 70 and 302 mm. long. Although the caudal fin is lunate, with both upper and lower angles produced, in *B. capriscus* as well as this species, the produced rays (2d from above and 2d from below) are much longer in the present one. A difference in the shape of the caudal is plainly evident in specimens 70 mm. long. At that size the caudal fin in *B. capriscus* is evenly and broadly convex, whereas in *B. vetula* it already is distinctly concave, though the angles are not yet produced. The soft dorsal has 29 and 30, and the anal 27 and 28 rays in the 2 specimens at hand.

The various stripes about the head and on the body that occur in adults are already present in the 70-mm. specimen.

Tropical Atlantic, ranging northward on the coast of the United States to or beyond North Carolina.

S. F. H.

Canthidermis sp.

Two small specimens of *Canthidermis*, 35 and 43 mm. long, were taken, one along shore, the other at sea. Whether they represent *C. sufflamen* or *C. sobaco*, if the two are distinct, is uncertain.

From snout to base of caudal the larger fish measures 36 mm.; head 15 mm.; depth 20 mm.; eye 4.0 mm., included twice in the snout measured obliquely. D. III-27; A. 24.

Body with fairly numerous light-colored cirri, much more conspicuous than in young *Balistes capriscus*, and up to two-thirds of the vertical diameter of the pupil in length. Scales on caudal peduncle with a single strong slightly retrorse spine; scales elsewhere on body chiefly with 3 spines along the anterior border, the median one strongest; in clusters on the head, the central ones highest.

Color very changeable; in darker phases showing several streaks radiating on cheek from below eye; a net of dark color about elongated light spots upon body, and round light spots on a dark ground on vertical fins. Under the dorsal are three dark spots corresponding to those similarly placed in *B. capriscus*.

W. H. L.

The collection contains 3 specimens, 30, 34, and 40 mm. long, which appear to belong to this genus. The specimens were found with small *Balistes capriscus* and are without a locality label. The 2 larger ones probably are the ones listed by Longley. The following proportions and enumerations are based on these specimens, given in the order of their size from smallest to largest: Head 2.3, 2.45, 2.45; depth 1.65, 1.6, 1.6; snout to dorsal 2.1, 1.9, 2.0. Eye in head 3.0, 3.25, 3.25; snout 2.25, 1.85, 1.9; interorbital 2.6, 2.8, 2.9; dorsal spine 1.8, 1.7, 1.6; pectoral 2.5, 2.75, 2.6. D. III-25, III-25, III-27; A. 22, 23, 24.

The largest specimen differs from the others in being much lighter in color, and in having some short dermal tentacles scattered over the side, which have been lost if ever present in the smaller ones. These young are not more slender than those of *Balistes capriscus*, as has been stated, perhaps of adults, but are at once distinguishable by the absence of modified, enlarged, platelike scales behind the gill opening.

S. F. H.

Family MONACANTHIDAE. FILEFISHES

Cantherines pullus (Ranzani)

Noticed chiefly along the blind channel leading south inside Bird Key reef, and outside the reef.

In coloration commonly very dark brown; its pattern much like that sometimes displayed by *Monacanthus ciliatus*. A dark line bounded above and below by light ones, all extending to base of caudal; sides above the lines with a V-shaped mark, light in color, with its apex directed backward and one limb along base of soft dorsal; another similar mark below them in corresponding relation to anal; a conspicuous white spot at posterior ends of dorsal and anal. It is paler over light bottom in both plain and striped phases.

W. H. L.

Only 1 specimen, 127 mm. long, was found in the collection. The following proportions and enumerations are based upon it: Head, measured to upper angle of gill slit, 3.2; depth at origin of anal 2.6; snout to base of dorsal spine 3.0. Eye in head 4.3; snout 1.1; interorbital 3.5; caudal peduncle 3.0; pectoral 2.7; dorsal

spine slender and barbless, though rough on anterior margin, situated over anterior two-thirds of eye, 1.25. D. 1-34; A. 31; caudal peduncle with a large area with enlarged scales, bearing spines of nearly uniform size; ventral flap not extending beyond spine; caudal short and round.

The preserved specimen retains no trace of the lateral stripes described in fresh material, nor of the other light markings mentioned. It is dark brown in color, and the sides of the snout are marked with several light lines.

Atlantic coast of tropical America, also in the West Indies and northward to Florida.

S. F. H.

Cantherines amphioxys (Cope)

Dr. Longley listed in his notes a single specimen, 51 mm. in length, taken south of Tortugas in 35 to 40 fathoms, which on comparison with Cope's type he identified as this species. Later he seems to have questioned whether *C. amphioxys* actually was a "good species," or the young of *C. pullus*. He apparently failed to acquire sufficient material to settle the question. The fin-ray counts, in the only specimen taken and in the one definitely identified as *C. pullus*, indeed agree. The dorsal spine, however, though agreeing approximately in position in the two, bears distinct barbs in the small specimen, which are missing in *C. pullus*, and there is a rather distinct 2d spine, extending well into the membrane. Furthermore, the small specimen has no enlarged scales with spines at base of caudal, whereas *C. pullus* has a large area of enlarged scales with spines, though none are outstandingly enlarged. In the related species *Monacanthus hispidus* and *M. ciliatus*, of which large series, ranging from young to adult, are at hand, no variation has been noticed in this respect. That is, in *M. hispidus* all the scales on the caudal peduncle are of nearly uniform size in the young as well as in adults, whereas in *M. ciliatus* some of the scales are enlarged at all ages, though the spines they bear are very variable in size. It seems improbable, therefore, that the difference in scales and spines on the caudal peduncle in the specimens of *Cantherines* at hand is due to a difference in age. The barbs on the dorsal spines in the related species named are proportionately larger in the young than in adults, but they are not lost with age. The silvery color of the specimen in hand also contrasts quite strongly with the dark brown color of *C. pullus*. It is the writer's opinion, therefore, that *C. amphioxys* very probably is a valid species.¹

The following proportions and enumerations are based on the specimen at hand, which agrees in size, number of fin rays, and color with the specimen described by Dr. Longley in his notes, though no identification or locality label was found with it. Head, measured to upper angle of gill slit, 2.5; depth at origin of second dorsal 2.3; snout to base of dorsal spine 2.75. Eye in head 3.75; snout 1.3; interorbital 3.75; caudal peduncle 3.6; pectoral 2.9. D. 11-34; A. 30.

The color of the fresh specimen, as described by Dr. Longley in his notes, was

¹ At the time the foregoing was written, I had overlooked a table of synonyms published by Dr. Longley (Carnegie Inst. Wash. Year Book No. 32, 1933, p. 294), wherein he assigned *C. amphioxys* to the synonymy of *C. pullus*. How he arrived at this conclusion is not stated.

metallic greenish, with brown dots, tending to run seven or eight to a row, and five or six longitudinal rows on the body. The preserved specimen is silvery, the dark dots remaining distinct; dorsal, anal, and pectorals colorless; caudal quite dusky; dorsal spine darker than body.

The generic position of this species has been uncertain. The definition of *Cantherines* apparently must be revised if the present species is placed in it, because it has barbs on the dorsal spine. If the statement that these barbs are absent is eliminated from the description of that genus, the only character left to distinguish it from *Monacanthus* is the more anterior position (over the eye, instead of behind it) of the dorsal spine.

Heretofore reported only from the West Indies.

S. F. H.

Alutera Oken

Les Alutères Cuvier, Règne animal, 1st ed., 1817, p. 153 (*Balistes monoceros* Osbeck).

Alutera Oken, Isis, 1817, p. 1183 (*Balistes monoceros* Osbeck).

Ceratacanthus Gill, Proc. Acad. Nat. Sci. Philadelphia, vol. 13, 1861, p. 57 (*Balistes auran-
tiacus* = *Balistes schoepfii* Walbaum).

Osbeckia Jordan and Evermann, Rept. U. S. Fish Comm., pt. 21, 1895 (1896), p. 424
(*Balistes scriptus* Osbeck).

Duvidia Miranda Ribeiro, Arch. Mus. nac. Rio de Janeiro, vol. 17, 1915 (Monacanthidae,
p. 9) (*Alutera punctata* Jordan and Rutter [not of Agassiz?] = ?*Balistes schoepfii*
Walbaum).

An error by Jordan and Rutter provides the sole justification for Ribeiro's genus *Davidia*, recognized by Jordan, Evermann, and Clark (Check list, 1930, p. 495). The teeth of the Jamaican fish, which the first-mentioned authors said were in a single series in each jaw, have, in fact, the same arrangement as in related species. As for the other genera mentioned above, Jordan, Evermann, and Clark wrote in the *Check list*, "The distinction of *Osbeckia* and *Ceratacanthus* from *Alutera* is questionable." For the first two certainly the point seems well taken. In a lengthy series of publications a figure of *Alutera schoepfii* has for nearly forty years passed as *A. scripta* without observed comment, except from Meek and Hildebrand (Field Mus. Nat. Hist., Zool. Ser., vol. 15, pt. 3, 1928, p. 803).

An observation regarding *Alutera ventralis* (see Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 278) necessitates a slight change of emphasis in the generic description. Not the absence of ventral fins, but their absence or reduction to a vestige of microscopic size, and the extension and curvature of the pelvic bone are the diagnostic features derived from these structures.

W. H. L.

Alutera schoepfii (Walbaum)

Balistes schoepfii Walbaum, Artdi pisc., pt. 3, 1792, p. 461—Long Island (after Schöpfung).

Alutera (*Ceratacanthus*) *punctata* Jordan and Rutter (not of Cuvier), Proc. Acad. Nat. Sci. Philadelphia, vol. 49, 1897, p. 127—Jamaica.

Alutera species dubia, and *Alutera punctata* Poey, Repertorio, vol. 2, 1868, p. 438—Cuba.

Large specimens were taken occasionally in 10 to 14 fathoms within and without the lagoon. Two swimming together came within the field of a submerged

light in 20 fathoms west of the group. A specimen a foot long, believed to be of this species, was seen on the flats just east of Bird Key harbor. It "floated" head downward with snout at the bottom and "drifted" slowly along, propelled by dorsal and anal fins only. The young are common in floating *Sargassum*, and were found occasionally also in the waste of the tern rookery.

The body increases greatly in depth with age, at least until a length of about 100 mm. is attained. In young 38 mm. long the depth is contained about 4.8 times in the length; in specimens 70 mm. long, about 3.3 times; in specimens 100 mm. long, about 2.6 times; and in a fish 285 mm. long, 2.4 times. The range in the number of rays in the second dorsal in 30 specimens is 33 to 37, and in the anal 35 to 40.

A living specimen, 123 mm. long, had in one phase an irregular median streak of white on the upper side of snout and nape, a broader one from throat to second dorsal origin, and an olive stripe from the mouth through eye to the interspace between dorsals. Behind the oblique suborbital white streak the body was largely olive, with four or five quadrate white spots at base of dorsal and behind it, and three similar spots at base of anal; side also with three horizontal lines of white. The shade is changeable, the olive at times becoming very dusky, at times very faint. In the palest phase, lines or dashes corresponding to some in *A. scripta* may be made out, also very small dark spots which behind the eye and in one or two longitudinal series on the body seem similarly to correspond to some of the dark spots of that species.

The Jamaican fish, "about 9 inches in length," on which Jordan and Evermann based their description of *Alutera punctata* has a standard length of 160 mm., depth between soft dorsal and anal origins 62 mm., distance from tip of lower jaw to upper margin of gill cleft 50 mm., eye 9.5 mm. The dorsal spine is slight; D. 37; A. 39 (not 36 and 35 respectively, as recorded). The body is now dark brown, with traces of small dark spots. Without close comparison with other specimens of the same size, the most significant points are the fin formulas and the thinness of the dorsal spine, which ally this fish with *schoepfii*.

Whether *Alutera punctata* Cuvier is a distinct species is uncertain. In the original description by Agassiz (in Spix, Pisc. brasil., 1829, p. 137, pl. 76) the fin formulas D. 25; A. 40 are given, and the accompanying plate shows D. 21; A. 24, neither of which remotely approximates the count in any other known specimen than the type.

Three specimens of *Alutera* from Natal, Brazil, which Starks referred to *A. punctata* (Stanford Univ. Pub., Univ. Ser., 1913, p. 63), in their number of soft rays (D. 36 to 37; A. 38 to 39) are within the range of variation of *A. schoepfii*, but are said to differ in texture from *A. schoepfii* of the same size.

W. H. L.

The collection contains 36 specimens, 38 to 225 mm. long, which I have identified as this species. The following proportions are based on 3 specimens, 54, 56, and 60 mm. in length to base of caudal. Head, measured to upper angle of gill slit, 3.4, 3.1, 3.3; depth, measured at dorsal spine, 3.4, 3.0, 3.0; snout to base of dorsal spine 3.2, 2.7, 3.3. Eye in head 3.9, 4.5, 4.0; snout 1.4, 1.3, 1.3; interorbital

5.4, 4.8, 5.1; caudal peduncle 3.7, 3.5, 3.5; dorsal spine 1.3 in 1 specimen, broken in the others. It is evident from these proportions and those of *A. ventralis* that the more slender body of the present species is reflected also in the shallower caudal peduncle.

Atlantic coast of tropical America, northward to New England. S. F. H.

Alutera ventralis Longley

Alutera ventralis Longley, Carnegie Inst. Wash. Year Book No. 34, 1935, p. 89—Tortugas, Florida. Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 278, fig. 26.

Alutera scripta (Osbeck)

Balistes scriptus Osbeck, Reise Ostind. China, 2d ed., 1765, p. 145—China.

Adults were rarely seen, one only being observed on rugged bottom at East Key. The young were found occasionally under floating *Sargassum* and in mixed *Thalassia* and *Cymodocea* which accompany it in shallow water, and 2 were taken in the trawl eastward of Bird Key reef.

For a specimen of 180 mm. in total length, measurements are as follows: Standard length 127 mm.; depth at second dorsal origin 37 mm.; head to posterior end of gill opening 43 mm.; gill opening 9 mm.; eye 8 mm.; orbital margin to base of dorsal spine 6 mm. D. I-47; A. 49.

The young are exceedingly changeable in coloration, as they turn light at once if put in a light dish, or dark if dark objects are put near them. They also turn dark on handling. Their pattern is less changeable than their shade. Body with more or less sharply defined polygons separated by narrow lines in two sets. The longitudinal division, in a specimen 150 mm. long, is effected by eight or nine interrupted bluish lines on deeper part of body, fewer on cheeks and posteriorly, and the transverse divisions are broken light lines; some of the polygons with dark centers, at least in the lighter phases; a triangular white area based on gill opening, extending back horizontally to beneath dorsal fin. In one common color phase there is a dark bar just behind the jaws, bounded posteriorly by a transverse light line; followed by a double bar on the snout, defined by the first and third of the light lines of the transverse series; six dark lines in next group, behind which comes a very broad pale one just before soft dorsal fin; a triple dark group; a double and a single one below soft dorsal fin; and three or four on caudal peduncle; all lost in a somewhat irregular pattern on sides; caudal distinctly barred.

A filefish, probably this species, about a foot long was seen "floating" head downward, snout at the bottom, in shallow water. Body slight, tail great in proportion, it "drifted" away slowly by action of dorsal and anal, without using caudal fin. It was blotched dark and light until struck at, then swam away with exceedingly pale ground color relieved only by profuse speckling of round dark spots.

W. H. L.

The collection contains 5 specimens, 85 to 225 mm. long. The following proportions and enumerations are based on the largest specimen: Head, measured

to upper angle of gill slit, 3.2; depth 3.2; snout to base of dorsal spine 3.1. Eye in head 5.5; snout 1.1; interorbital 4.45; caudal peduncle 2.5. D. 48; A. 51.

The large number of fin rays distinguishes this species readily from *A. schoepfi* and *A. ventralis*, but not so readily from *A. guentheriana*, from which it differs prominently in the more slender body.

Known from many tropical seas, ranging northward on the coast of the southern Atlantic states. S. F. H.

Alutera guentheriana Poey

A single specimen was taken in the 10-fathom channel east of Loggerhead bank. It had a total length of 167 mm.; length to base of caudal 137 mm.; depth between dorsal and anal origins 55 mm.; head to upper angle of gill opening 45 mm.; gill opening 13 mm.; eye 10 mm.; orbital margin to base of dorsal spine 10 mm.; dorsal spine 33 mm.; D. 1-49; A. 50; pectoral rays 14; caudal short and rounded (if there was any slight tendency to assume a double lunate form, it was masked by injury).

Not seen alive. The preserved specimen had about six dark spots along base of dorsal and five at base of anal, alternating with light areas; round dark spots on body with the same general arrangement as in *Alutera scripta*, but fewer. Caudal dark, with three faint light lines crossing basal two-thirds. W. H. L.

The large specimen mentioned above was not found. The collection contains 3 specimens, however, about 76, 87, and 90 mm. long (caudal damaged in each), 53, 70, and 72 mm. to base of caudal, which I have identified as belonging to this species. It is evident from the measurements above and those that follow that this fish has a body fully as deep as *A. ventralis*, from which species it differs prominently in the more numerous dorsal and anal rays. The following proportions and enumerations are based on the 3 specimens just mentioned: Head, measured to upper angle of gill slit, 2.9, 3.1, 2.9; depth at dorsal spine 2.1, 2.1, 2.25, at origin of second dorsal 2.8, 2.4, 2.5; snout to dorsal spine 2.9, 2.9, 3.1. Eye in head 4.25, 4.3, 5.0; snout 1.3, 1.2, 1.3; interorbital 4.0, 3.8, 4.2; caudal peduncle 3.6, 3.3, 3.8. D. 46, 46, 48; A. 48, 47, 50. The dorsal spine is injured in each specimen, but it appears to be stocky, probably shorter than in *A. schoepfi*, and with larger barbs.

The color is about as described by Dr. Longley for the larger specimen, except that the dark spots and blotches mentioned form most of the ground color, and the paler color, except on the abdomen, is reduced to little more than reticulations.

West Indies and Florida, apparently sometimes straying northward.

S. F. H.

Monacanthus ciliatus (Mitchill)

The young of this species were taken, with those of *Monacanthus hispidus*, in turtle grass at Long Key and elsewhere.

In 50 specimens the range in fin formulas is D. 31 to 36; A. 30 to 35, the most frequent combinations being D. 33 to 35; A. 32 or 33.

In a tank planted at one end with turtle grass and at the other covered with

sand and dead coral, color changes were observed in captive fish which without doubt resulted from the surroundings, as the fish were green if among or over the plants and gray if over sand and coral. In pattern they may be almost self-color, or much mottled, or striped. In the striped phase the main stripe runs from eye, past dorsal margin of gill aperture, to middle of base of caudal; three parallel stripes run upward and backward below the main one, the first meeting the chief stripe slightly behind middle of body; the next running to posterior end of anal fin; and the third just above base of anal throughout its length; a line from eye to upper angle of base of caudal, bounded dorsally by a light line; and another dark stripe above it.

In tanks the fish commonly rests head downward beside blades of turtle grass or other vertical objects, as it does in nature, according to scanty observation.

W. H. L.

Many specimens, 35 to 112 mm. long, are included in the collection. There is exceedingly great variation among specimens, even of the same length, in the development of the ventral flap, and also in the size of the spines on the caudal peduncle. Modified or enlarged scales, however, seem to be present always on the peduncle, even in the smallest specimens at hand, wherein it differs from *M. hispidus*, which has no modified scales and none with especially enlarged spines on the peduncle at any age. The often published figures of Jordan and Evermann (Bull. U. S. Nat. Mus., No. 47, pt. 4, 1900, pl. 249, figs. 634, 635) do not bring out this apparently constant difference. The choice of a specimen for illustration, if indeed it was *M. ciliatus*, was an unfortunate one, as there is not one adult among the many at hand, including also some material from Panama, in which the ventral flap is as small as shown in Jordan and Evermann's figure. I can see no character in the drawing which definitely identifies it with *M. ciliatus*.

Atlantic coast of tropical America, ranging northward at least as far as North Carolina.

S. F. H.

***Monacanthus hispidus* (Linnaeus)¹**

The young were found in abundance in turtle grass off Long Key and elsewhere, and also in the open sea with floating *Sargassum*. Larger fish were caught in the 10-fathom channels within the lagoon, and from rather deeper water outside Bird Key reef. They also occasionally visited the sandy waste north of Loggerhead Key.

In 100 specimens the counts of dorsal and anal rays range from 29 to 34 in the former, and 28 to 34 in the latter (the most frequent combinations being D. 31 to 33; A. 31 to 33), a condition quite distinct from that in *M. oppositus* Poey, the average number of dorsal and anal fin supports being about four greater, if Meek and Hildebrand's Panama material is representative. These authors (Field

¹ Dr. Longley did not list synonyms in his unfinished manuscript, but in his copy of the Check list (1930, p. 494) he indicated that he would add *Monacanthus spilonotus* Cope (Trans. Amer. Philos. Soc., vol. 14, 1871, p. 476) to the already long list of synonyms in that book. In Carnegie Inst. Wash. Year Book No. 32 (1933, p. 294) he indeed published *M. spilonotus* as a synonym of *M. hispidus*.—S. F. H.

Mus. Nat. Hist., Zool. Ser., vol. 15, pt. 3, 1928, p. 798) gave dorsal and anal rays each 27 to 29, and in a sample of 6 of their fish I found 1 with 27, 4 with 28, and 1 with 29 in each fin. The elongate spots streaking the sides of their fish are so much finer pencilings than those on Tortugas specimens that they give them a distinctive appearance.

It is interesting that Poey did not recognize *M. hispidus* in his collections. Meek and Hildebrand (see reference above) reported only *oppositus* from Panama; Beebe and Tee-Van (Zoologica, vol. 10, 1928, p. 258) only *oppositus* from Haiti; Fowler (Proc. Acad. Nat. Sci. Philadelphia, vol. 83, 1931, p. 405) only *oppositus* from Trinidad; Jordan and Rutter (Proc. Acad. Nat. Sci. Philadelphia, vol. 49, 1897, p. 127) *hispidus* only, from Jamaica; Evermann and Marsh (Bull. U. S. Fish Comm., vol. 20, pt. 1, 1900 (1902), p. 259) *hispidus* only, from Puerto Rico; Metzelaar (Trop. atl. Vissch., 1919, p. 164) *setifer* only, from Curaçao. The inference may be incorrect, but the records suggest that *hispidus* is replaced south of the Florida Strait by *oppositus*, the southern references to *hispidus* lacking details for identification.

The two actually are much alike in general appearance. In both, the ordinary scale bears a pedicel, expanded distally to form a leaflike blade, inclined backward, and spinose at the margin, the median tip being strongest. The males of both species have on the sides of the caudal peduncle scales armed with a simple spine inclined slightly toward the tail. The rays of the dorsal and anal fins in each seem thinned in the same way at their bases, from the absence there of the considerable mass of spinules which they bear just above the bases.

Dry morsels as these fish would seem to be, they fall a prey to the terns of the Bird Key colony in great numbers. They may be picked up from the ground by hundreds at intervals of a few days during the period while the young are still taking food from the parents most ineptly.

Fish seined in turtle grass are commonly in a mottled green phase, and those dipped up with *Sargassum* in patterns of brown. Over bare sandy bottom they may be almost uniform pale gray, and in dark slate-bottomed aquaria may even approach black in color. The induced changes, however, are not permanent or even semipermanent, for even the black is replaced promptly by light shades if the fish are transferred to lighter-colored surroundings.

Cape Cod to the Florida Keys, sometimes straying northward, and possibly ranging southward.

W. H. L.

Monacanthus tuckeri Bean

Monacanthus tuckeri Bean, Proc. Biol. Soc. Washington, vol. 19, 1906, p. 33—Bermuda; Field Columbian Mus., Zool. Ser., vol. 7, 1906, p. 78, fig. 11.

The collection contains 3 specimens, 43, 50, and 72 mm. long. The smallest and largest specimens are without a definite locality label. The other one was taken in the channel west of White Shoal. Nothing was found among Dr. Longley's notes indicating that he recognized this species, which probably is rare locally.

This species approaches *Alutera* in shape, differing, however, in having a free

ventral spine; snout long, more tubelike than in other local species, its upper outline deeply concave; caudal fin short and round; dorsal spine robust, with two rows of strong barbs on its posterior lateral edges; a few enlarged scales near base of caudal, which do not bear recurved spines.

The following proportions and enumerations are based on the 3 specimens in hand: Head, measured to upper angle of gill slit, 2.75, 2.7, 3.0; depth at origin of anal 2.7, 2.9, 2.9; snout to base of dorsal spine 2.9, 2.9, 2.9. Eye in head 3.8, 3.8, 3.8; snout 1.3, 1.4, 1.3; interorbital 5.4, 5.2, 4.5; caudal peduncle 3.1, 3.5, 3.4; pectoral 3.75, 3.9, 3.6. D. I-35, I-35, I-33; A. 36, 35, 34.

Color brown, pale or silvery on abdomen and lower parts of head. The specimen of intermediate size has an ill defined dark lateral band. Pale lines, forming reticulations, and crossline on snout, which have been described as forming hieroglyphics. These markings are most distinct on the largest specimens, and missing, except on the snout, in the smallest one. Dark dots are variously distributed over the body, and the caudal fin, which is grayish brown, is marked with indefinite light crossbars.

Bermuda and Tortugas.

S. F. H.

Family OSTRACIIDAE. TRUNKFISHES

Jordan and Evermann (Bull. U. S. Nat. Mus., No. 47, pt. 2, 1898, p. 1721) quoted the following from G. Brown Goode: "The chief function of the broad pectorals [of the trunkfishes] seems to be that of forming a current of water through the gills, thus aiding respiration, which would otherwise be difficult on account of the narrowness and inflexibility of the branchial apertures. When taken from the water one of these fishes will live for two or three hours, all the time solemnly fanning its gills, and when restored to its native element seems none the worse for its experience, except that, on account of the air absorbed, it cannot at once sink to the bottom." It is improbable, however, that the behavior of these fishes is correctly described. Specimens of *Lactophrys triqueter* and *L. tricornis* were removed from the water, to put the matter to test. They commonly "sat" immobile as far as fin movement was concerned, as they also did in water shallow enough to cover only their mouths. Given only that much water, with fluttering breathing valves and gill covers pumping at a rate almost beyond possibility of counting by direct observation, they may force a stream of water over their gills, or reverse the current and send it gushing out of their mouths in a strong jet.

W. H. L.

Lactophrys triqueter (Linnaeus)

(Plate 32, figures 1, 2)

This fish was seen on the reefs occasionally.

It feeds alike over bottom covered with algae or with sand. Sand and algae in large quantities fill the digestive tract. In feeding it often assumes a nearly vertical position, and through its mouth blows a water stream strongly upon the spot it is about to examine, throwing up sand in a cloud. When it is so engaged,

Halichoeres bivittatus and young *Thalassoma bifasciatum* always accompany it, just as they follow feeding goatfishes, for the purpose of catching any animal that may be driven out of the sand and escape the trunkfish.

The coloration is changeable. It is noticeably paler over sand, and more olivaceous among gorgonians. The dark color of the body, with its white spots, is continued from the margin of the orbit across the dorsal surface of the eye beyond the outer margin of the iris, which is itself dark. W. H. L.

There are no specimens in the collection.

Atlantic coast of tropical America northward to North Carolina, sometimes straying to Cape Cod. S. F. H.

***Lactophrys bicaudalis* (Linnaeus)**

Nothing on this species was found among Dr. Longley's manuscripts, and no specimens in his collection. In his notebooks it seems to be mentioned only once, the capture of a 75-mm. specimen being reported.

Jordan and Thompson (Bull. U. S. Bur. Fish., vol. 24, 1904 (1905), p. 249) reported it from Tortugas with the notation, "One seen. New to the United States fauna." Gudger (Carnegie Inst. Wash. Pub. 391, 1929, p. 199) reported 2 specimens from Tortugas, with a description and photographic reproduction of his smaller specimen, which was about 80 mm. long.

The carapace behind the dorsal fin is fully closed, as it is in *Lactophrys tricornis*, but unlike the latter it has no frontal spines (horns).

West Indies to Florida.

S. F. H.

***Lactophrys trigonus* (Linnaeus)**

The young, 10 to 40 mm. in length, were seined commonly on the grass flats. This species may be recognized at once by the single free plate on the dorsal side of the caudal peduncle behind the dorsal fin. In young, 35 mm. in length, an angle in the ventral keel indicates the position of a future spine.

In a specimen 160 mm. long it was noticed that the coloration was changeable, and that elements in the pattern were homologous with parts of the dark bars of *Lactophrys tricornis*.

In an attempt to determine the effect of the apparent motion of the bottom below it on a swimming fish, specimens were tested in a glass-bottomed tank beneath which an endless belt of figured cotton cloth was drawn. This fish usually headed against the fictitious current and "stood" still. But if by chance it turned, it could be raced down the length of the tank immediately. W. H. L.

The collection contains 12 young, 20 to 55 mm. long.

Atlantic coast of tropical America to Florida, sometimes straying northward to Cape Cod. S. F. H.

***Lactophrys tricornis* (Linnaeus)**

Small specimens were taken inside Bird Key reef. Larger ones were caught at depths of 10 to 15 fathoms within and without the lagoon. Large ones were seen

occasionally on the open reef. Despite their relative rarity, the carapaces of two were taken from the stomach of *Hypoprion brevirostris*.

This species is changeable in coloration. With minor variation in shade and extent of dark areas, a specimen 87 mm. in length showed in an aquarium, the bottom of which was covered with sand and planted in part with green *Thalassia*, a vertical bar of orbital width passing through the eye to ventral keel, and two much more indefinite ones. The anterior one passed from the ventral keel through the pectoral base and curved back, widened, and reached the highest point of the carapace. The posterior bar, wider than the others, lay in advance of the posterolateral spines, from which it proceeded upward and backward to include the dorsal fin. A larger specimen swimming slowly, with pectorals only, over a mixed bottom of coral fragments and sand with sparsely distributed algae and turtle grass, whose green was largely hidden by gray incrustations and sediment, appeared in a blotchy phase, dark on light, with a few blue spots showing through.

W. H. L.

The collection contains 11 specimens, 27 to 168 mm. long. The frontal spines, or "horns," and lateral spines are already evident in the smallest specimen, and in one 35 mm. long they are proportionately much larger than in adults, the lateral ones at that size extending beyond base of caudal.

Atlantic coast of tropical America, sometimes straying northward to Cape Cod. Also reported from Africa.

S. F. H.

Family TETRAODONTIDAE. PUFFERS

Lagocephalus laevigatus (Linnaeus)

A single specimen, 60 mm. long, was found in the refuse of the tern colony on Bird Key.

D. 13; A. 13½. Four-rooted spines (not 3-rooted as stated by Jordan and Evermann, Bull. U. S. Nat. Mus., No. 47, pt. 2, 1898, p. 1728) on the belly in an area extending from chin to vent; upper jaw with a thick vertical ridge on either side of the median line.

A light bar at base of caudal; outer rays light, remainder black; dorsal and anal fins darker toward tip.

Though partly digested, teeth, spines, fin rays, and silver sides identify this specimen, from which a 78-mm. example collected by Poey (Mus. Comp. Zoöl. no. 12155) differs only in having lost the black of the caudal fin.

Atlantic coast of tropical America, ranging northward to Massachusetts.

W. H. L.

Sphoeroides spengleri (Bloch)

On the grass flats, where bare sand occurs among the *Thalassia*, partly grown specimens were taken, which also occur far up in the sandy bight between Long and Bush keys. Larger ones, to the length of about 160 mm., were commonly caught in the 10-fathom channels and in 13 to 14 fathoms east of Bush Key and Bird Key reef.

Prickles on the back are less evident than one might anticipate from some descriptions. They are, indeed, usually wanting. When present, the area they occupy is of very variable extent. Sometimes it is only a small patch above pectoral origin; sometimes it extends from interorbital space nearly to dorsal origin. No prickles on sides, but the under surface of head and trunk, except for small areas behind jaws and before anus, is abundantly supplied with them; dorsal and anal regularly with 8 and 7 rays respectively, of which the 1st in each equals only about one-third the base of the fin; pectoral rays 12 to 14, besides an upper vestigial ray.

Dorsal surface gray when the fish is over light bottom, its fine mottling simulating the appearance of the sand. Among *Thalassia* the mottled gray is replaced by green continuous with the permanent green on the sides. This ground color, speckled and spotted with darker, becomes lighter below, replaced abruptly by white at the level of the lower margin of the longitudinal series of dark spots, which with the two dark bars on the caudal are diagnostic. W. H. L.

The collection contains 18 specimens, 65 to 157 mm. long, which apparently belong to this species. Four of these were taken in two hauls, one made east of Bird Key reef, and the other to the southeast of Bird Key. The others are without a locality label.

The following proportions and enumerations are based on 3 specimens, 93, 115, and 130 mm. in length: Head 2.8, 3.0, 2.9; distance from snout to origin of dorsal 1.4, 1.4, 1.4. Eye in head 4.9, 4.5, 4.5; snout 1.8, 2.0, 1.9; interorbital (bone) 6.75, 6.4, 5.5; caudal peduncle 5.6, 5.3, 5.8; pectoral 2.7, 2.9, 2.6. D. 8, 8, 8; A. 7, 7, 7; P. 13, 13, 13, exclusive of uppermost rudimentary ray.

Atlantic coast of tropical America to Florida, sometimes straying northward to Cape Cod. S. F. H.

Sphoeroides dorsalis Longley

Tetrodon (Sphoeroides) harperi Metzelaar (not of Nichols), Trop. atl. Vissch., 1919, p. 170—St. Eustatius.

Sphoeroides marmoratus Breder (not of Ranzani), Bull. Bingham Oceanog. Coll., vol. 1, art. 1, 1927, p. 79—Green Cay, Bahamas.

Sphoeroides dorsalis Longley, Carnegie Inst. Wash. Year Book No. 33, 1934, p. 259—Tortugas, Florida. Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 280, fig. 27.

Family CANTHIGASTERIDAE. SHARP-NOSED PUFFERS

Canthigaster rostratus (Bloch)

Tetrodon rostratus Bloch, Ichth., vol. 1, 1782, pl. 146—India.

Tetrodon ornatus Poey, Repertorio, vol. 2, 1868, p. 433—Cuba.

Sphoeroides asterias Blosser, Ann. Carnegie Mus., vol. 6, 1909, p. 300, pl. 12, fig. 2—St. Croix.

Rather rare at Tortugas. A single specimen, 95 mm. long, was speared outside Bird Key reef while diving; 2 others were seen at a depth of 2½ fathoms, east of East Key; and one was found in the waste from the tern rookery on Bird Key.

Body brown above a line from mouth and over pectoral to base of upper caudal rays, along which the pigmentation continues to their tip; a less distinct line, as broad as eye, from lower jaw, beneath pectoral to above anal fin, where it expands, covering lower part of side and ventral surface of caudal peduncle, and continuing along lower rays of caudal. In life the side above and below this line pale, with small round blue spots on cheek, others on side of caudal peduncle, and eight or nine transverse rows of such spots, or narrow blue lines, on its under surface.

W. H. L.

The collection contains 2 specimens, 68 and 95 mm. long. The larger one undoubtedly is the one mentioned by Dr. Longley. The smaller one is a specimen in good condition, which retains rather distinct color markings. In general, the color and pattern agree with those of the larger specimen described. The smaller one, however, has the two longitudinal bands partly composed of pale markings which enclose dark spots. In fact, the upper band is quite chainlike. On the snout and sides of the head the pale markings are coarser and more elongate, forming mostly short longitudinal lines. In the small specimen the dark bands do not extend on the outer rays of the caudal fin as in the larger one.

The following proportions and enumerations are based on the 2 specimens at hand: Head 2.6, 2.5; snout to origin of dorsal 1.4, 1.4. Eye in head 3.5, 3.5; snout 1.7, 1.6; interorbital 3.4, 3.4; caudal peduncle 3.0, 2.5; pectoral 3.5, 3.6. D. 10, 10; A. 9, 9½; P. 16, 15.

Apparently occurring on both coasts of the Atlantic; known from the American side from the West Indies, Florida, and Bermuda.

S. F. H.

Family DIODONTIDAE. PORCUPINE FISHES; BURFISHES

Diodon hystrix Linnaeus

Occasionally seen lurking in *Orbicella* heads.

The 3-rooted spines are readily erectile in the living fish in its inflated condition, since their connections with one another are flexible. The caudal peduncle and dorsal and anal fins are not hidden within the distended skin of the swollen fish, as they are in *Diodon holacanthus*. The predorsal spines are notably 3-rooted, and the postpectoral ones double the frontal spines in length. D. 15½ or 16; A. 15½ or 16; P. 25, including the dwarfed upper ray.

The coloration of *D. hystrix* commonly varies little, but an individual in the aquarium became much lighter whenever a *Pomacentrus* pecked trifling abrasions about the bases of several broken spines. At a length of 310 mm. the vertical and pectoral fins are much spotted.

Widely distributed in tropical seas; on the Atlantic coast of America northward to Florida and sometimes to Cape Cod.

W. H. L.

Diodon holacanthus Linnaeus

This species, which seems quite distinct from *Diodon hystrix*, was taken commonly, to the length of 125 mm., on the usual seining grounds throughout the summer.

Dorsal and anal rays respectively $13\frac{1}{2}$ and 14 in 2 specimens; the frontal spines, at the length mentioned, equal the postpectoral. Because of the shortness of the anterior root and direct opposition of the 2 lateral roots, all spines, except the few short ones immediately before the opercular cleft, may be raised easily and independently.

Its ability to inflate itself with air or water is great. At the utmost, dorsal and anal fins, as well as the entire caudal peduncle, are "swallowed up" and lost beneath the distended skin.

There are color changes with the excitement of handling and inflation, apart from the mere mechanical effect of stretching the skin. For example, the band through the eye disappears in the inflated fish. In smaller individuals, up to a length of 125 mm. at least, the fins are immaculate except for a few spots on the pectoral base.

W. H. L.

The collection contains 7 specimens, 40 to 125 mm. long, which apparently are of this species.

Widely distributed in tropical seas, ranging northward to Florida. S. F. H.

***Chilomycterus schoepfi* (Walbaum)**

Erratic in appearance. During the last half of August 1924, small individuals, only about 35 to 50 mm. long, were rather common along the shore of Loggerhead Key, on the flats about Fort Jefferson, and on Bird Key flats, although it had not been observed during the preceding ten years.

Changeable in shade. A fish followed for 15 or 20 minutes as it swam over bottom bare in some places, covered with turtle grass in others, showed that its changes in shade were responses to color changes in the substratum. In a specimen 138 mm. long, the iris was brassy yellow and darker toward the outer margin, beyond which the ball of the eye, in so far as it is exposed in eye movements, was of the same color as the lighter tracts of the body. A dark line encircled the eye, and in a position of rest was more or less concentric with the dark circle on the iris. The skin about the eye was readily extensible. The movement of the eye, therefore, was revealed only by the shifting of the pupil and slight changes in width of the pattern elements about it.

W. H. L.

The collection contains 6 specimens, 72 to 80 mm. long. These are brownish above, varying greatly in shade among themselves. The lower parts vary from a dirty white to dusky, the spines, however, being pale in all specimens. The head and body anteriorly bear alternating pale and dark stripes of about equal width, the stripes being horizontal on posterior part of head, but running in various directions on the snout and cheeks, sometimes forming crossbands on the snout. A large black spot above and partly behind base of pectoral, another one lower down on side at tips of lower rays of pectoral, and another surrounding base of dorsal, these spots sometimes ocellated; fins plain translucent.

Florida to Massachusetts Bay.

S. F. H.

Family LOPHIIDAE. ANGLERS

Lophius piscatorius Linnaeus. ALLMOUTH

Dr. Longley's field data contain records of the capture of 10 specimens, ranging in length (not stated for 2) from 100 to 312 mm., taken south of Tortugas at depths of 60 to 253 fathoms.

The collection contains 3 specimens, 75, 133, and 278 mm. long.

This is the widely distributed goosefish, or allmouth, known from both coasts of the northern Atlantic, ranging southward on the American side in deep water to the West Indies.

S. F. H.

Family ANTENNARIIDAE. FROGFISHES

Histrio gibba (Mitchill). SARGASSUM FISH

(Plate 34)

Common in floating gulfweed; carnivorous, voracious, and peculiar in form and structure.

It liberates its eggs in a single gelatinous mass, which floats like a raft, monstrous in proportion to the size of the fish which produces it. Before its discharge the egg mass lies close packed in the ovaries like a bank note tightly rolled up from its two ends.

Head large; gape enormous; oral breathing valves well developed; external branchial apertures reduced to small circular openings in axils of pectorals. As a result it is able to propel itself slowly through the water, without recourse to ordinary swimming movements, for after the mouth has been filled, pressure on the contained water causes it to stream out the gill openings with sufficient force to move the fish.

Its pertinacity in stalking prey is sometimes remarkable. One fish followed an atherinid from end to end of a 2-foot tank eight times without rest before darting suddenly upon it and swallowing it. Usually it waits quietly for the individual it sees draw near, the attack being delayed until a head-on approach of the prospective victim is close. Thus it captures fishes almost as large as itself.

In the details of their pattern the sargassum fish are highly variable. Their bodies and fins are streaked and mottled with brown and yellow interspersed with small round spots or thin irregular lines of white, all of the precise hues which prevail in the masses of algae to which the species is practically confined. The apparent size and conspicuousness of the eye is reduced, and its movement hidden, by the extension of the body color to the margin of the pupil. The upper surface of the tongue and the floor of the pharynx back to and including the fourth branchial arch are marked with mottled brown and white simulating the external pattern. Very changeable in shade, light individuals turning dark at once when an attempt is made to catch them in tanks, whereas dark ones lighten readily if given opportunity to come to rest in *Sargassum*, or become even lighter in lighter-colored excelsior.

W. H. L.

The collection contains 12 specimens, 25 to 87 mm. long.

Atlantic coast of Panama, West Indies, and Florida.

S. F. H.

Antennarius scaber (Cuvier)

Two specimens, 100 and 105 mm. long, were taken in 9 to 11 fathoms west of White Shoal. One was a female with ovaries rather well developed on June 27. These were in the form of a strip about 15 mm. wide, closely rolled toward the center from opposite ends. The margins of the ovarian envelope in either end of the roll were closely bound with connective tissue to one another, turn upon turn. When it was freed and extended, a raft 80 mm. in length, without allowance for additional growth or imbibition of water, resulted.

Ground color vinaceous buff, slightly and irregularly frosted with white; a drab pattern on this ground includes spots and dashes on top of head and two radiating systems of lines—a major system centering about eye, a minor one about 3d dorsal spine—together covering body to pectorals; irregular broken bars on trunk and dorsal fin; rounded nonocellated spots in several transverse series on the other fins and remainder of body; iris with radiating striae; upper surface of tongue from base to tip mottled with drab on a white ground in distinct pattern.

These fish were highly inconspicuous in a vessel of water containing the red alga *Gracillaria compressa*. Their blending with their surroundings was effected partly by appropriate color and countershading, partly by their abundant cirri, which cluster on the 2d and 3d dorsal spines and are close-set along margin of dorsal fin. On the sides some are nearly half as long as the head. Toward the ventral side they are more filamentous and more freely branched, but with the lateral branches short, and they are absent only on the belly. In general appearance the cirri much resemble small branching algae and hydroids.

The base of the "fishing rod" is advanced beyond the margin of upper jaw. The rod is considerably longer than the 2d spine, and the "bait" is bifid, fleshy, a third as long as the rod, and singularly wormlike. When not in use it is coiled up and pressed in a hollow behind 2d spine.

Schmitt first called my attention to the ability this fish has of inflating itself like the puffers. Out of water it swells to relatively enormous size by filling its stomach with air.

W. H. L.

The 2 specimens described are at hand, and now have a length of 96 and 97 mm. (standard length 71 and 75 mm.). The following proportions and enumerations are based on these 2 specimens. Head, measured to gill opening, 1.65, 1.65; width of head 3.1, 2.8; depth at eyes 2.8, 3.0. Eye in head about 12.5, 15; snout 7.2, 6.9; interorbital (bone) 6.0, 6.2; maxillary 2.8, 3.0; caudal peduncle 4.5, 4.3; pectoral 2.25, 2.4. D. III-12, III-12; A. 7, 7; P. 10, 10; C. 9, 9.

The ground color of the preserved specimens is gray, and the system of lines described by Dr. Longley remains very distinct, now brownish with darker margins.

Atlantic coast of Panama, West Indies, and Florida.

S. F. H.

***Antennarius radiosus* Garman**

Taken repeatedly at depths of 45 to 65 fathoms, up to 92 mm. in length.

D. II-I-13; A. 8; P. 12. First spine very slender, one and one-half times 2d, inserted at base of 2d and distinctly behind margin of upper jaw; "bait" small and demonstrably single under the high power of the binocular; snout much shorter than orbit; mouth closing vertically, its cleft subterminal; scales nearly everywhere bifid at tip, enlarged on head, more complex about pores of lateral-line system, so making its course readily visible; lateral line beginning at tip of mandible, running along its inferior border, dividing at angle of mouth, superior branch proceeding to tip of snout and back above eye, joining inferior one above and behind eye; lower branch curved just within the preopercular margin, before uniting with upper one; both joined by a branch on nape uniting the systems; the main trunk then proceeding backward by a devious course to caudal peduncle.

Cream color, netted with gray tracery. Pattern extending beyond oral cleft to membranes of lower jaw, everywhere becoming less distinct toward the belly, which is plain. A conspicuous ocellus with "pupil" as large as eye beneath soft dorsal, half on fin, half on back; another spot under 1st ray of soft dorsal, two contiguous ones under 3d ray and just below lateral line, one behind pectoral base, and one beneath end of dorsal fin, all differing from the ordinary ocellus in having the black pupil largely diminished by a pale center; tail with two dark crossbars.

Like *Antennarius scaber*, this fish distends itself greatly by taking water or air into its stomach when it is handled.

W. H. L.

The collection contains 19 specimens, 32 to 92 mm. long. The following proportions and enumerations are based on 4 specimens, 43, 63, 83, and 92 mm. long. Head, measured to gill opening, 1.6 to 1.75; depth 1.75 to 2.0; width of head 3.8 to 4.3; depth at eyes 2.25 to 2.4. Eye in head 6.1 to 6.8; snout 8.8 to 9.7; interorbital 7.4 to 8.3; maxillary 2.1 to 2.3; caudal peduncle 4.1 to 4.4; pectoral 2.3 to 2.7. D. III-13; A. 8; P. 13; C. 9.

The color of preserved specimens is gray, somewhat darker above than below; ocellated spots of fresh specimens still visible, though faint. In addition to markings mentioned, there are various irregular dark lines and indefinite spots on the body and fins, which are more distinct in some specimens than in others.

On dissection it was found that sometimes, though apparently not always, there is a 4th rudimentary dorsal spine, hidden underneath the skin behind the 3d free one. Only the free ones were enumerated in the formulas given above.

Apparently known only from the Florida Keys.

S. F. H.

***Antennarius multiocellatus* (Cuvier and Valenciennes)**

Chironectes multiocellatus Cuvier and Valenciennes, Hist. nat. poiss., vol. 12, 1837, p. 422—Cuba.

Antennarius corallinus Poey, Repertorio, vol. 1, 1865, p. 188; *ibid.*, vol. 2, 1868, p. 405—Cuba.

Antennarius verrucosus Bean, Proc. Biol. Soc. Washington, vol. 19, 1906, p. 31—Bermuda; Field Columbian Mus., Zool. Ser., vol. 7, 1906, p. 88, fig. 14.

Antennarius astroscopus Nichols, Bull. Amer. Mus. Nat. Hist., vol. 31, 1912, p. 109, fig. 1—Barbados.

I have had a single specimen, 60 mm. long, taken just beside Bird Key reef.

It had recently eaten a *Malacoctenus macropus* 50 mm. long.

To the naked eye the fish was largely muddy gray, with a suggestion of underlying maroon, more distinct on the ventral side, but the fresh fish lacked the rose which in irregular patches is spread freely on alcoholic material. Its ocellated spots, which consist of a large one at base of soft dorsal and in part on dorsum, with several incipient small ones toward the fin's free margin; one on base of anal; three on caudal; one at base of 3d dorsal spine; one on side above pectoral; and one on side behind it, help to distinguish it.

On the lips, the tips of 2d and 3d dorsal spines, the lateral faces of the dorsal fin, the back in general, the caudal peduncle, and the caudal fin are numerous branched dermal processes that look like tiny hydroid stems with their polyps.

The long, delicate 1st dorsal spine reaches base of 3d and bears at its tip a fleshy "bait."

As Poey stated in *Memorias* (vol. 1, 1853, p. 220), the type was sent by him to Cuvier. Cuvier and Valenciennes' statement, "Nous avons reçu cette neuve espèce ou variété de la Martinique par M. Garnot," read without reference to the context, has resulted in the type locality's being listed incorrectly by some authors as Martinique instead of Cuba.

W. H. L.

I learned from Dr. Longley's notes that he examined in the Musée d'Histoire Naturelle, Paris, the type (no. 4591), a specimen 88 mm. long. There he examined 2 others, 1 from Martinique and another from Guadeloupe. In the Museum of Comparative Zoölogy, Cambridge, he examined 3 specimens identified as *Antennarius corallinus*, taken in Cuba, St. Thomas (?), and Whale Cay. In the American Museum of Natural History, New York, he examined 3 specimens, at least in part identified as *A. astroscopus*, in part from "Florida." Then, in the Academy of Natural Sciences of Philadelphia, he examined 3 more (no identification stated) from St.-Martin and "Sta. Cruz, W. I." Finally, he studied his own specimen from Tortugas, Florida. The specimens examined, according to incomplete length measurements given, varied at least from 60 to 155 mm. From the study of this material Dr. Longley concluded that *A. verrucosus* and *A. astroscopus*, previously considered distinct, are synonyms of *A. multiocellatus*.

Dr. Longley's specimen is now 57 mm. long (standard length 43 mm.). The following proportions and enumerations are based on this fish: Head, measured to gill opening, 1.8; depth 1.95; width of head 3.2; depth at eyes 2.4. Eye in head 12; snout 7.5; interorbital 6.3; maxillary 2.4; caudal peduncle 3.4; pectoral 2.6; 1st dorsal spine 2.0; 2d dorsal spine 4.0. D. III-12; A. 7; P. 10; C. 9.

The color markings of the fresh fish remain visible in the preserved specimen. It may be added, however, that in addition to the ocellated spots mentioned, many smaller black spots or dots are present, particularly in the lateral-line

system and on the vertical and pectoral fins. There are also numerous pale and white spots and dots on the body and fins.

West Indies to Florida.

S. F. H.

***Antennarius annulatus* Gill**

Only one specimen, 55 mm. long, from the 11-fathom channel west of White Shoal, was taken.

In its stomach when taken was a 30-mm. *Coryphopterus glaucofraenum*.

D. III-12½; A. 6½. Dorsal spines well separated; the 1st long and slender, reaching well beyond insertion of 3d, its "bait," possibly injured, seeming basically bifid; lips ciliate; body and fins with few and inconspicuous cirri. Capable of distending itself greatly.

Ground color apple green, netted indistinctly on back and plainly on belly with citron yellow; spots of ground color largest below dorsal fin and on caudal peduncle, appearing minutely freckled with black under magnification, elongate on cheek, radiating from eye; tending toward the hexagonal on ventral surface; an irregular gray spot before soft dorsal, connected with another rather larger gray nucleus above pectoral; diffuse gray before pectoral; tip of 2d dorsal spine, its web, and tip of 3d gray; a gray spot in dorsal axil extending downward on caudal peduncle; ocelli and near ocelli very many, one below 3d dorsal spine, another slightly farther forward but lower and behind eye, one above upper border of pectoral base, another on side behind lower border of pectoral base, the greatest of all partly on soft dorsal and partly on back, beneath bases of rays 8 to 10, three large and dark ones on basal half of caudal, about eight fainter ones more distally placed, chiefly in a subterminal series, another large one on base of anal between 3d and 6th rays, more in series near its margin, and still others on upper side of pectoral.

W. H. L.

The specimen described by Dr. Longley was doubtfully identified by him as this species. I have read the original description of *Antennarius annulatus* with the specimen in hand. I find no disagreement, except for the color on the caudal peduncle. The specimen, instead of having a broad pink ring encircling base of caudal as in the specimen described by Gill, has a pink blotch on dorsal surface of caudal peduncle, with only slight downward projections just behind base of dorsal.

Though the original description mentioned no exceptions, some, but not all, of the spines covering the skin are bifid.

This species has rested in the synonymy of *A. multiocellatus* for some time. Dr. Longley examined the type of that species, however, in the Musée d'Histoire Naturelle, Paris, and identified another specimen in his collection with it. The specimen identified as *A. multiocellatus* differs strongly in color from the one here identified as *A. annulatus*, as is brought out in the descriptions herewith. It is true that several prominent ocelli are similarly situated in the two, but *A. multiocellatus* is much more profusely spotted than *A. annulatus*, and lacks the pink (gray in life) spots conspicuous in the latter. The former also has the

lateral-line system marked with black dots, which are wanting in the latter.

Although proportions and fin-ray enumerations are nearly identical in the two, the species differ markedly in the roughness of the body. Though most of the spines are bifid in each species, those of *A. multiocellatus* are much longer and more pointed, especially on the sides of the head and along the lateral lines.

The following proportions and enumerations are based on the specimen in hand: Head, measured to gill opening, 1.8; depth 1.9; width of head 3.7; depth at eyes 2.3. Eye in head 6.6; snout 7.1; interorbital 5.9; maxillary 2.6; caudal peduncle 3.3; pectoral 2.8. D. III-12; A. 7; P. 9; C. 9.

Apparently known only from Tortugas, Florida.

S. F. H.

Antennarius pleurophthalmus Gill

The collection contains 3 small specimens, 34, 40, and 42 mm. long, without data, which I refer to this species with some doubt. In fact, I am not even certain that they are all of one species, because of differences in color, as will be brought out subsequently. Certainly none of them belong to any other species herein described. At least 1 of the 3 specimens has the characteristics of *Antennarius pleurophthalmus*, as described by Gill, though the character of the "bait" cannot be checked because of an injury. *Antennarius pleurophthalmus*, indeed, has rested in synonymy under *A. ocellatus* for some time, where it may belong. The descriptions of *A. ocellatus* that have been available to me, however, do not meet the requirements of the specimens in hand, whereas Gill's description of *A. pleurophthalmus* does describe one of the specimens in hand rather fully, and the others moderately well.

It is evident from the study made of the Tortugas material, in connection with specimens in the U. S. National Museum, that the species of this genus are very imperfectly understood. It does not seem advisable, therefore, to attempt a division of the 3 small specimens before me, which differ chiefly in color.

The following proportions and enumerations are based on the 3 specimens in the collection. It will be seen that the specimens agree fairly well in these respects, even though they differ in color. Head, measured to gill opening, 1.6, 1.5, 1.75; depth 1.7, 1.9, 1.9; width of head 5.4, 5.3, 4.3; depth at eyes 2.5, 2.6, 2.7; interorbital 6.5, 9.0, 7.0; maxillary 2.4, 2.8, 2.6; caudal peduncle 4.8, 4.75, 4.3; pectoral 3.3, 2.7, 2.4. D. III-12, III-12, III-12; A. 8, 7, 7; P. 10 and 11, 9 and 9, 9 and 10; C. 9, 9, 9.

Skin covered with minute spines, in part bifid; 1st dorsal spine short, failing to reach tip of 2d if depressed; "bait" bilobate in 2 specimens, injured in the smallest one; 2d spine short, stout, somewhat curved, lower two-thirds attached to back by membrane, reaching nearly or quite to base of 3d spine, about as long as snout and half eye; 3d spine longer, especially in the 2 larger specimens, wherein it nearly reaches origin of soft dorsal, attached to back by membrane except at tip, curved with contour of back.

The smallest specimen has ocelli precisely as described by Gill, consisting of one on dorsal fin, on and between rays 5 and 6; another somewhat forward of this one and on middle of side; and still another farther forward and higher on the body, forming with the other two, if connected by lines, the apex of a tri-

angle. Below and somewhat forward of the last-mentioned ocellus is a smaller one, and there is still another at about mid-length on middle rays of caudal. In addition to the dark spots or ocelli mentioned, the body and fins, exclusive of the abdomen and ventral fins, are speckled with smaller dark dots.

The other 2 specimens agree with the one just described in having an ocellus on soft dorsal, situated on and between rays 8 and 9 in one and 9 and 10 in the other. No other ocelli are present in either specimen. The 42-mm. fish, which is light brown, has scattered dark points on upper parts of body, and on all the margins of the fins. The 40-mm. specimen is rather darker brown; has a pinkish cast along back, on caudal peduncle, and on dorsal, caudal, and anal fins; the fins in part being rather deep pink, this color broken up and intermixed with pale markings distally on dorsal and anal, and on entire caudal fin. The pale markings extend to upper parts of body, where there also are a few minute dark specks.

Apparently known only from Florida.

S. F. H.

Family CHAUNACIDAE

The presence of a single dorsal spine, the rostral or "bait spine," has been considered an important character for separating this family from the *Antennariidae*. I find, however, that Tortugas specimens of *Chaunax* actually have 1, sometimes 2, more dorsal spines than *Antennarius*, all the spines except the 1st being hidden under the loose skin. The 2d and 3d spines indeed are long, and the 2d one also rather stout. These spines are followed by 2 rudimentary ones (short, stout stumps), which may be easily detected by running the side of a dissecting needle along the median line of the back. *Antennarius* and *Histrio* each have only 1 rudimentary spine at most, as determined by dissection, between the 3d free spine and the origin of the soft dorsal. The 2d and 3d dorsal spines of *Chaunax* cannot be felt under the skin because they are long and lie close to the back.

It is evident, then, that the number of dorsal spines is not a valid character for separating the genera mentioned into two families. The gill opening in *Chaunax*, however, is well behind the base of the upper rays of the pectoral, and lies under the anterior part of the base of the soft dorsal, whereas in *Antennarius* and *Histrio* it is just below the base of the pectoral. Furthermore, the head is low and broad in *Chaunax*, whereas it is compressed in the other genera. Regan, in his classification of the *Pediculati* (*Ann. and Mag. Nat. Hist.*, ser. 8, vol. 9, 1912, pp. 261-289), listed other osteological characters. The remaining differences, then, still seem to justify the retention of the family Chaunacidae.

S. F. H.

Chaunax pictus Lowe

Chaunax pictus Lowe, *Trans. Zool. Soc. London*, 1846, p. 339—Camera de Lobos, Madeira.
Chaunax nuttingii Garman, *Bull. Lab. Nat. Sci. Univ. Iowa*, vol. 4, 1896, p. 86, pls. 2 and 3, fig. 2—Sand Key Light, Florida.

Dr. Longley did not prepare an account of this species, nor a synonymy. He did question in his notes, as others have done, whether *C. nuttingii* was actually

distinct, and he stated that if so the Tortugas specimens, judging by fin-ray counts, belonged to that species. Enumerations made by Dr. Longley and by me show complete overlapping of dorsal rays of the two nominal species. No specimen, however, was found among the Tortugas material having only 5 anal rays, the number given in current works for *C. pictus*, though a few had only 6, the usual number being 7. This further variation in number of anal rays may well occur within one species. It is possible, also, that the 1st ray, which sometimes is minute, may have been overlooked. Again, it may sometimes be hidden in the skin like the 1st ray of the soft dorsal, as determined by dissection. As the difference in the number of fin rays apparently is not valid, and as I fail to find other distinguishing characters in the study of the descriptions, figures, and specimens in hand, I have designated *C. nuttingii* as a synonym, though it apparently may properly be questioned whether specimens from the Orient assigned to this species actually belong there.

The collection contains 9 specimens, 44 to 130 mm. long, with which there is no locality label. This species apparently is rather common in deep water south of Tortugas. Dr. Longley listed 79 specimens from that vicinity, taken in 10 different hauls at depths of 135 to 392 fathoms.

The following proportions and enumerations are based on 3 specimens, 69, 70, and 130 mm. long. The depth measurements, because of the softness of the fish and because it probably is capable of inflating itself somewhat, are only approximate. Neither can the eye be accurately measured, as there is no definite demarcation, the skin over the eye being continuous with that of the head. Head, measured to the gill opening, 1.6, 1.6, 1.5; width of head 2.9, 3.0, 2.9; depth at eyes 2.3, 2.5, 2.7; greatest depth 3.0, 3.7, 3.3. Eye in head 7.1, 6.4, 8.5; snout 7.1, 8.0, 8.5; interorbital (bone) 16, 15, 12.5; maxillary 2.8, 2.9, 3.4; 1st dorsal spine with "bait" 14, 16, 11; pectoral 4.9, 4.9, 4.5. D. I-10, I-11, I-11; A. 7, 7, 7; P. 11, 11, 11; V. 4; C. 8, 8, 9.

Dr. Longley counted fin rays in 15 specimens and found 3 with I-11 rays in dorsal, and the rest with I-12. He found 2 specimens with 6 rays in anal and the rest with 7. In one specimen examined he found 12 pectoral rays and 9 caudal rays.

The discovery of additional dorsal spines, hidden under the skin, has already been discussed. There actually are 5 dorsal spines (as revealed by 3 specimens dissected), instead of only 1 as given in the foregoing paragraph.

The "bait" of the 1st spine in the Tortugas specimens is broad and transversely flat, and has a fringed margin, not pointed as shown in Goode and Bean's figure (Ocean. Ichthyol., 1895, pl. 117, fig. 398).

The preserved specimens are uniform light gray.

This fish is readily recognized among the Tortugas fauna by the low, broad head; the large, vertical mouth; the finely prickled skin; the strongly developed system of lateral lines that lie in "canals," destitute of prickles; and the single short free dorsal (rostral) spine, with its broadly expanded "bait."

Probably widely distributed; taken in the Florida Keys and northward in the Gulf Stream to Rhode Island.

S. F. H.

Family OGCOCEPHALIDAE. BATFISHES

Dr. Longley examined many specimens of this family in American and European museums, and found that the species, especially those of the genus *Ogcocephalus*, were very imperfectly understood. Unfortunately he was not able to complete his studies. I have salvaged what I could from his notes, so far as they applied to the local species, but much of his work is a total loss. I have prepared the following key, which is introduced to show the chief diagnostic characters of the local genera and species.

S. F. H.

KEY TO THE GENERA AND SPECIES

- a. Disk with frontal region elevated, with a more or less produced rostrum, long and prominent in some species; eyes lateral; teeth on vomer and palatines; dorsal normally with 4 rays *Ogcocephalus*
 - b. Pectoral with 13 rays; black spots (polka dots) at least in shoulder region, and often on sides of head and tail
 - c. Rostral process very short, its projection in advance of eye about equal to diameter of eye; base of pectoral plain or merely black-spotted, not with black spots and white lines *nasutus*
 - cc. Rostral process longer, its projection in advance of eye greatly exceeding diameter of eye, proportionately longer in young than in adults; base of pectoral with dark spots and white lines, forming reticulations *cubifrons*
 - bb. Pectoral with 10 or 11 rays; no prominent dark spots on shoulder region or elsewhere
 - d. Rostral process short, its projection in advance of eye about equal to diameter of eye; body very rough, spines and tubercles numerous, many of them low and stout, buckler-like; some of spines in upper part of disk surrounded at base with brown rings; pectoral tips dark; tip of caudal pale (red in life) *parvus*
 - dd. Rostral process notably longer, its projection in advance of eye being equal to two or more times diameter of eye; body only moderately rough, spines and tubercles smaller; tips of pectorals and caudal black
 - e. Rostral process moderately long, its projection in advance of eye about 2.3 in head, the latter measured from tip of upper jaw to gill opening; spines and tubercles on body rather small, many with pungent tips; color above dark brown, spines pale, making surface appear pale-spotted *vespertilio*
 - ee. Rostral process very long, its projection in advance of eye about 2 in head, the latter measured from tip of upper jaw to gill opening; spines and tubercles fewer and larger, blunt, not with pungent tips; color plain grayish sp.
- aa. Disk with frontal region not elevated, no rostral process or spine, snout rounded; eyes partly superior; dorsal normally with 6 rays

- f. Vomer and palatines with teeth; disk perfectly smooth ventrally; "wrist" of pectoral attached to body by skin; pectoral fin with 16 rays; upper surface grayish and dotted with white, generally also with brown streaks, sometimes forming reticulations, rings, or angular figures *Halieutichthys aculeatus*
- ff. Roof of mouth without teeth; disk ventrally rough, with numerous fine tubercles; "wrist" of pectoral largely free from body; pectoral fin with 13 rays; upper surface plain gray . . . *Dibranchius atlanticus*

Ogocephalus nasutus (Cuvier and Valenciennes)

Dr. Longley identified a few specimens doubtfully as of this species, but none in his collection were so labeled. I have referred to it 3 specimens, 107, 135, and 140 mm. long. If the 135-mm. fish belongs here it must be assumed to be abnormal, as it has no rostral process. In other respects it agrees fairly well with the other 2.

This species has been referred to as the short-nosed species. In the 2 normal specimens at hand, the distance from the tip of the rostrum to the eye is about equal to the diameter of the eye. The following proportions and enumerations are based on the 2 normal specimens. The larger one apparently has been dry, making fin-ray counts impracticable. Head, measured to gill opening and without rostral process, in length, the latter also measured without rostral process, 2.0, 2.1; depth 5.3, 5.4. Eye in head 5.6, 6.3; rostrum in advance of eye 6.0, 6.9; interorbital 6.8, 8.1; caudal peduncle 4.9, 5.9; pectoral 1.6, 2.1. D. 4; A. 4; P. 13. The number of fin rays in the apparently abnormal specimen agrees with the normal ones.

The smaller specimen and the abnormal one have dark spots (polka dots) on the shoulder area, sides of the head, and laterally on the tail, which may have been present on the third one, but possibly were destroyed by drying. The pectorals and caudal are black-tipped.

West Indies to Florida.

S. F. H.

Ogocephalus cubifrons (Richardson)

(Plate 33, figure 2)

?*Lophius radiatus* Mitchill, Amer. Monthly Mag., vol. 2, 1818, p. 326—Straits of the Bahamas.

Lophius (Malthe) cubifrons Richardson, Fauna Bor. Amer., vol. 3, 1836, p. 103, pl. 96—Labrador (highly improbable).

Rather common in 10-fathom channels; occasional in shallow water. Local material includes 17 specimens, 44 to 295 mm. long, all from the channel east of Loggerhead bank.

With these fish before me it appears that the rostrum scarcely grows longer after the fish reaches a standard length of 50 mm. In a specimen 51 mm. in standard length it measures 10 mm., and in only one, 66 mm. long, of several up to 240 mm. does it attain a length as great as 11 mm. The interorbital width meanwhile increases from 4.0 mm. to 17 mm. From the standard length of 150 mm. at least the rostrum is "a mere button-like tubercle." In 5 fish, 102 to 123

mm. in standard length, the rostrum enters 10.2 to 12.3 times into that dimension. In fish having a standard length of 40 to 50 mm. the rostrum enters the standard length only 5 to 7 times. Whether the rostral groove is longer than broad depends, as Beebe and Tee-Van (Zoologica, vol. 10, 1928, p. 272) observed in discussing another species, on the proportions of the rostrum itself. In fish of medium length or larger it is usually about as wide as high, but it may be twice as high as wide, and in small fish the height is from one and one-half times to twice the width. It is clear, therefore, that the proportions of the rostral cavity and the length of the rostrum itself have little value as diagnostic characters.

The very young are dark gray on the under side; older fish coppery red, with much individual variation in color on the dorsal side, usually lighter or darker brown, variegated with reddish orange or yellow-orange patches, disappearing in preserved specimens; the chief patches behind eyes, the two sometimes meeting across the nape to form a great U-shaped mark open to the rear; usually an additional one above and behind the branchial aperture; and one about base of soft dorsal fin. Even at a standard length of 50 mm. there is some, and in fish of medium and large size much spotting with light-bordered dark spots in a long, narrow tract from eye to gill opening. Here the spots usually are less crowded than elsewhere, and more nearly circular. On sides of head, margin of disk, and sides of trunk, the pattern is less open, being principally a network of light lines on the dark ground. Small fish have pectorals and caudal yellow proximally and dark brown distally, with a netted pattern appearing first at the base of these fins and extending gradually to their tips, the yellow advancing before it at the expense of the darker brown, which gives way to the lighter color on which the marbling spreads.

The stomachs of 3 specimens examined contained chiefly crustaceans and mollusks. The fish clearly is not limited to food it may catch by angling with its protrusible rostral tentacle and conspicuous fleshy trilobed "bait."

With the exception of 2 specimens from Texas in the U. S. National Museum, the 30 examined in collections were from Florida. A shallow-water species, the greatest recorded depth at which it was taken being 37 fathoms, just outside Key West harbor. These facts of distribution make it improbable that Mitchell's *Lophius radiatus* (see reference above) is the same. W. H. L.

The collection contains 11 specimens, 40 to 237 mm. long, which I have identified as this species.

The following proportions and enumerations are based on 3 specimens, 63, 70, and 190 mm. long. Head, measured to gill opening and without rostral process, in length, the latter also without rostral, 2.0, 2.0, 2.0; depth 5.0, 4.8, 4.8; tip of upper jaw to vent 2.1, 2.2, 2.4. Eye in head 5.8, 6.0, 9.4; rostral process in advance of eye 3.0, 2.8, 5.3; interorbital 6.4, 7.1, 6.0; caudal peduncle 4.8, 5.0, 4.8; pectoral 2.2, 2.1, 2.4. D. 5, 4, 4; A. 4, 4, 4; P. 13, 13, 13 (counted in 2 others; also 13 each).

The color as described above remains, except of course for the red, orange, and yellow, which have become pale. The black-and-white netting on the base of the pectoral seems distinctive.

Apparently known only from the Gulf coast of the United States. S. F. H.

Ogcocephalus parvus Longley and Hildebrand

Ogcocephalus parvus Longley and Hildebrand, Carnegie Inst. Wash. Pub. 517, 1940, p. 283, fig. 28—Tortugas, Florida.

Ogcocephalus vespertilio (Linnaeus)

Much less common at Tortugas than *Ogcocephalus cubifrons*. The 3 specimens seen were 134, 85, and 70 mm. long, one of which was taken in 11 fathoms west of White Shoal, and the others in 30 and 45 fathoms south of the atoll.

After preservation the smallest fish is gray, with pectoral, anal, and caudal fins black-tipped. Its rostrum enters 6 times into standard length, and the rostrum of the largest one enters $6\frac{2}{3}$ times into standard length. The breadth of the disk is a comparatively unreliable measure, as in one fish during normal breathing it may vary from 53 to 56 mm., and it may reach 66 mm. if the fish is excited by holding it in the hand under water.

Ground color of the largest specimen in life, hazel above; tips of larger spines along back before dorsal rosy, the many lesser spines everywhere gray-tipped, constituting fine flecks on the brown; a fine pattern of spots in radiating series about gill openings; iris with fine lines radially arranged at pupillary border, forming a network peripherally and extending beneath the opaque covering of eye; pectorals and caudal buff-yellow over basal half, passing through maroon-purple to prune purple at tips, the contrast between the darker outer third and the yellow basal two-thirds being sharper on under side of pectorals; belly, maxillary membranes, and buccal cavity coppery red. W. H. L.

The collection contains 2 specimens, 81 and 126 mm. long, which presumably are the 2 larger specimens listed by Dr. Longley.

The spines are of smaller average size, and finer and sharper in these specimens than in the other local species represented in the collection.

The following proportions and enumerations are based on the 2 specimens in the collection. Head, measured to gill opening and without rostral process, in length, the latter also without rostral process, 2.0, 2.0; depth 4.5, 4.6; tip of upper jaw to vent 1.7, 1.6. Eye in head 7.4, 6.2; rostral process in advance of eye 2.3, 2.3; interorbital 6.8, 7.1; caudal peduncle 4.5, 4.7; pectoral 2.6, 2.4. D. 4, 4; A. 4, 4; P. 11, 12.

Both specimens are dark brown above, with pale spines making the surface appear pale-spotted and dotted; pale spots around eye also consisting of small spines; pectorals and caudal distally dusky in the smaller specimen, and black in the larger one.

From Dr. Longley's notes on the examination of various museum specimens, perhaps conducted after the foregoing was written, I infer that he was in doubt as to whether this species actually should be called *vespertilio*, apparently believing that that species originally was described from Brazil, and that Brazilian specimens were not the same as the Tortugas ones. I am unable to find, however, that he reached a definite conclusion.

West Indies to North Carolina and probably southward to Brazil. S. F. H.

Ogcocephalus sp.

After identifying specimens with the four species recognized by Dr. Longley, I have left over 3 specimens, respectively 70, 85, and 95 mm. long. These fish are without definite locality data. They are nearest the specimens identified as *Ogcocephalus vespertilio*, a name to which Dr. Longley referred in his notes as a "catch-all in museums." The 3 specimens mentioned, however, have a still longer rostral process, and the spines on the upper surface are considerably coarser, more buckler-like, blunter, and less numerous. The color is grayish, whereas it is brownish in *O. vespertilio*. The pectorals and caudal are black-tipped in both lots.

It seems probable that the 3 specimens in hand may be one of the "synonyms" of *O. vespertilio*. They certainly are different from the 2 specimens identified as *O. vespertilio* by Dr. Longley. The necessary material and time are not available to me now to determine whether the specimens have or have not been named. Therefore, for the present they are left without specific designation.

The following proportions and enumerations are based on the 3 specimens in hand. Head, measured to gill opening and without rostral process, in length, the latter also without rostral process, 1.6, 2.0, 2.0; depth 3.5, 4.5, 4.25; tip of upper jaw to vent 1.4, 1.7, 1.7. Eye in head 6.0, 7.2, 6.4; rostral process in advance of eye (damaged in smallest specimen) 2.0, 2.0; interorbital 7.4, 7.25, 8.0; pectoral 2.1, 2.5, 2.3. D. 4, 4, 4; A. 4, 4, 4; P. 11, 11, 11.

S. F. H.

Halieutichthys aculeatus (Mitchill)

A single small specimen was taken in the 11-fathom channel within the lagoon, 6 at about 14 fathoms east of Bird Key reef, and hundreds at depths of 45 to 65 fathoms.

This is clearly a fish adapted to life on bare sandy or muddy bottom. When it rests in a tank, as it does through the day, it backs down into the sand and with convulsive twitching of its pectoral fins throws it up over the posterior margin of its disk. It may cover itself with so thin a layer that its contour is scarcely hidden. Its dorsal and caudal fins may even rise above the surface, and its eyes apparently are never concealed; yet the gray of its dorsal side, netted with a tracery of reddish brown, blends so well with its surroundings that the fish is at all times comparatively difficult to discover.

It is much more active by night than by day. It comes out of hiding each evening at dusk, and "creeps" about sluggishly, right and left pectoral fins being advanced in regular alternation. It may also swim freely and rapidly. If the tank is covered with a black cloth by day, it grows as restless as when darkness comes naturally.

In a handful of these fish when dead there is often great difference in the appearance of the pupils. Sometimes both pupils are nearly circular, sometimes one is large and the other small, and sometimes neither is visible except under a lens. In the partially contracted pupil its circle is encroached upon by an angle above and below, the upper one being behind the vertical of the lower. Closure

occurs by the upper border overriding the lower one. The eye begins to close immediately if a light is flashed on it at night, and a high degree of contraction is attained within 3 seconds.

W. H. L.

The collection contains 17⁶ specimens, 38 to 85 mm. long. In each of 2 specimens counted, the dorsal had 6 rays, the anal 4, and the pectoral 16. The "wrist" of the pectoral is not free, being wholly adnate to the body by skin. The gill opening is near the base of the attached wrist. Though the body spines or prickles are rather stout on the upper surface, the ventral surface is perfectly smooth.

In preserved specimens the ground color is grayish above and white underneath; upper surface dotted with white, some specimens being more profusely spotted and dotted than others; body spines generally surrounded by white, forming the larger spots, and smaller pale dots not surrounding spines, variously distributed; more or less definite short brown streaks present, running in various directions, forming reticulations or even rings, quadrilaterals, hexagonals, and other figures in some specimens; pectoral with an indefinite brown band at base and a broad dark bar at mid-length, the rest of the fin being pale; caudal pale, with three indefinite brown crossbars; ventrals white like the ventral surface of the fish.

West Indies, the Bahamas, and Florida.

S. F. H.

Dibranchius atlanticus Peters

Dr. Longley's field data report the capture of 91 individuals, ranging in length (which is not given for all the fish caught) from 40 to 150 mm., taken at depths of 135 to 430 fathoms. The collection contains 6 specimens, 42 to 93 mm. long.

This species is readily distinguished from *Halieutichthys aculeatus* by the feel, as the ventral surface is rough, being beset with numerous tubercles, whereas that surface is perfectly smooth in the other species named. The "disk" also is more angulate, but that difference is not great enough to distinguish the two species readily, without having them together for direct comparison. In *Dibranchius atlanticus* the "wrist" is largely free, whereas it is attached to the body in *H. aculeatus*, as pointed out elsewhere. The gill opening is on the inner side of the wrist and near its base. The roof of the mouth bears no teeth. In each of 2 specimens examined, the dorsal has 6 rays, the anal 4, and the pectoral 13.

Apparently occurring in rather deep water on both sides of the tropical Atlantic.

S. F. H.

INDEX

(Boldface type indicates the names adopted in this work, and the pages on which descriptions appear)

A

- aberrans, *Liopropoma*, 101
 abildgaardi, *Sparisoma*, 207; pl. 27 f. 1, 2,
 pl. 28 f. 1
 abildgaardi, *Sparus*, 207
 Ablennes, 29
 Abudefduf, 183
 Acanthemblemaria, 272
 acanthias, *Squalus*, 3
 Acanthuridae, 154
 Acanthurus, 154
 accensum, *Plectropoma*, 109
 Achiridae, 48
 aculeatus, *Halieutichthys*, 315
 acuminatus, *Eques*, 144; pl. 20 f. 2
 acuminatus, *Myrichthys*, 18
 acus, *Strongylura*, 29
 acutus, *Scarus*, 219
 adscensionis, *Epinephelus*, 93
 adustus, *Pomacentrus*, 178
 Aëtobatus, 4
 afer, *Alphestes*, 98
 afer, *Epinephelus*, 98
 affine, *Plectropoma*, 109
 affinis, *Auchenopterus*, 259, 262
 affinis, *Cremnobates*, 263
 affinis, *Fierasfer*, 282
 agassizii, *Callionymus*, 234
 agassizii, *Dicromita*, 278
 agassizii, *Scorpaena*, 159
 alatus, *Prionotus*, 172
 albicaudus, *Auchenopterus*, 259
 albifimbria, *Scorpaena*, 162
 albigutta, *Kathetostoma*, 245
 albirostris, *Hippichthys*, 57
 Albula, 5
 Albulidae, 5
 album, *Haemulon*, 122
 Alectis, 82
 Alepocephalidae, 14
 alletteratus, *Euthynnus*, 72
 Allmouth, 303
 Alphestes, 98
 alternans, *Scarus*, 218
 altus, *Pseudopriacanthus*, 113
 Alutera, 291
 alutus, *Apogonichthys*, 89
 amabilis, *Argyropelecus*, 16
 Amber jack, 76
 americanum, *Apogon*, 87
 americanus, *Menticirrhus*, 143
 amphioxys, *Cantherines*, 290
 amplus, *Scarus*, 207
 analis, *Lutianus*, 119; pl. 10 f. 1
 analis, *Pomacentrus*, 181
 anchovia, *Sardinella*, 6, 10
 anchovia, *Sardinia*, 6
 Anchoviella, 12
 Anchovies, 12
 Ancylopsetta, 39
 Anglers, 303
 Anisotremus, 129
 annulatus, *Antennarius*, 307
 anomalus, *Triacanthus*, 285
 Antennariidae, 303
 Antennarius, 304
 Antigonina, 146
 Antigoniidae, 146
 antillarum, *Monolene*, 46
 apicalis, *Alosa*, 9
 apicalis, *Sardinella*, 9
 apodus, *Lutianus*, 118; pl. 9 f. 2, pl. 24
 f. 2
 Apogon, 84
 Apogonichthys, 89
 Apogonidae, 83
 aprion, *Gerres*, 140
 apua, *Bodianus*, 99
 apua, *Mycteroperca venenosa*, 99
 aracanga, *Pseudoscarus*, 216
 arborescens, *Acanthemblemaria*, 272
 Archosargus, 134
 arctifrons, *Calamus*, 131
 arctifrons, *Citharichthys*, 43
 arcuatus, *Chaetodon*, 151
 arcuatus, *Pomacanthus*, 151
 arenatus, *Priacanthus*, 112
 arenatus, *Rypticus*, 102
 argenteus, *Eucinostomus*, 136, 139
 argentimaculatus, *Xyrichthys*, 201
 Argentina, 14
 Argentinidae, 14
 argus, *Cremnobates*, 262
 Argyropelecus, 16

ascensionis, *Holocentrus*, 53; pl. 2 f. 1
aspera, *Acanthemblemaria*, 272
aspera, *Paremblemaria*, 272
asterias, *Spheroides*, 300
astroscopus, *Antennarius*, 306
ataeniatus, *Sarothrodus*, 152
Atherinidae, 68
atlantica, *Scorpaena russula*, 164
atlanticus, *Benthodesmus*, 73
atlanticus, *Bregmaceros*, 34
atlanticus, *Dibranchus*, 316
atlanticus, *Rupiscartes*, 270; pl. 31 f. 2
atlanticus, *Salarias*, 270
atlanticus, *Tarpon*, 5
atomarius, *Scarus*, 209
atrobranchus, *Prionodes*, 106
atrocyaneus, *Pomacentrus*, 181
Auchenistius, 264
Auchenopterus, 259
Aulostomidae, 66
Aulostomus, 66
aurantiacus, *Balistes*, 291
aureorubens, *Pronotogrammus*, 111
aureo-ruber, *Sparus*, 207
aureus, *Chaetodon*, 152
aureus, *Pomacanthus*, 152; pl. 22 f. 1, 2
aurifrons, *Opisthognathus*, 242; pl. 30 f. 1
aurita, *Sardinella*, 5, 6
aurofrenatum, *Sparisoma*, 211
aurolineatum, *Amia*, 86
aurolineatum, *Bathystoma*, 127
aurolineatus, *Apogon*, 86
auropunctatus, *Callyodon*, 205, 206
auropunctatus, *Cryptotomus*, 206
aurorubens, *Rhomboplites*, 121
aya, *Chaetodon*, 150

B

bahianus, *Acanthurus*, 156
bairdi, *Callionymus*, 235
bajonado, *Calamus*, 132
baldwini, *Prionodes*, 106
Balistes, 286
Balistidae, 286
balteatus, *Pomacanthus*, 152
Barathronus, 280
barbata, *Brotula*, 276
barbatulum, *Laemonema*, 36
barbatum, *Echiostoma*, 15
Barbudos, 52
barracuda, *Sphyracna*, 69; pl. 2 f. 2
Barracudas, 69
bartholomaei, *Caranx*, 78

Batfishes, 311
Bathygadus, 32
Bathygobius, 224
Bathypercis, 237
bathypphilus, *Iridio*, 195
Bathypterois, 25
Bathystoma, 127
Batrachoididae, 283
beanii, *Poecilopsetta*, 48
Bellator, 173
bellus, *Synagrops*, 91
Belonidae, 27
Bembrops, 237
Benthodesmus, 73
Benthoscopus, 244
bergii, *Scorpaena*, 161
bermudensis, *Carapus*, 282
bermudensis, *Corythoichthys*, 59
bermudensis, *Hypoleurochilus*, 268; pl. 31 f. 1
bermudensis, *Lefroyia*, 282
beryllinus, *Cryptotomus*, 205, 206
beta, *Serranus*, 107
bicaudalis, *Lactophrys*, 298
bicolor, *Barathronus*, 280
bifasciatum, *Thalassoma*, 196; pl. 26 f. 1
bifasciatus, *Labrus*, 196
Bigeys, 112
bilinearis, *Merluccius*, 38
bimaculatus, *Chaetodon*, 149
binghami, *Garmannia*, 228, 229
binghami, *Garmannia* (*Risor*), 229
binghami, *Xyrichthys*, 199
binotatus, *Apogon*, 88
bishopi, *Alosa*, 10
bishopi, *Sardinella*, 10
bistrispinus, *Rypticus*, 102
bivittatum, *Diplectrum*, 104
bivittatus, *Halichoeres*, 191; pl. 12 f. 1, pl. 17 f. 1, pl. 19 f. 2, pl. 25 f. 2, pl. 32 f. 1, 2
bivittatus, *Serranus*, 104
Black angelfish, 151, 152
Black grunt, 123
Black moray, 19
blackfordi, *Yarrella*, 15
Blanquillos, 145
Blennies, 246
Blenniidae, 246
Blennius, 266
Blue parrot fish, 217
Blue tang, 155
Bodianus, 189
boekei, *Callionymus*, 236

boekei, *Doratonotus*, 198
boleosoma, *Gobionellus*, 230
 boleosoma, *Gobius*, 230
 bollmani, *Scarus*, 216
Bollmannia, 231
 bonaci, *Epinephelus* (*Mycteroperca*), 99
bonariense, *Haemulon*, 123
 bondi, *Malacoctenus*, 255
 Bonefish, 5
 Bonnetnose shark, 3
boqueronensis, *Bollmannia*, 231
 Bothidae, 39
Bothus, 47
 bowersi, *Mycteroperca*, 99
 brachialis, *Scarus*, 212
brachycephalus, *Hippichthys*, 57
 brachycephalus, *Syngnathus*, 57, 60
Brachygenys, 128
brachysoma, *Diplacanthopoma*, 279
Branchiostoma, 1
 Branchiostomidae, 1
 Brannerella, 257
 brasilianus, *Apogon*, 87
 brasiliensis, *Brannerella*, 257, 258
brasiliensis, *Hemiramphus*, 30
brasiliensis, *Saurida*, 23
brasiliensis, *Scorpaena*, 160
 brederi, *Corythoichthys*, 60
 brederi, *Rhegma*, 112
Bregmaceros, 34
 Bregmacerotidae, 34
brevirostris, *Hypoprion*, 2
 bricei, *Chaetodon*, 147
 Broad Soles, 48
Brotula, 276
 Brotulidae, 276
 brunneus, *Hippocampus*, 65
 bucciferus, *Clinus*, 252
bucciferus, *Labrisomus*, 252, 254, 255
 bucciferus, *Malacoctenus*, 255
 Burfishes, 301
 Butterfly Fishes, 147

C

caeruleus, *Acanthurus*, 155
 caeruleus, *Scarus*, 217
 Caesar grunt, 124
Calamus, 130
 calamus, *Calamus*, 131; pl. 17 f. 1
 calamus, *Pagellus*, 131
calcarata, *Scorpaena*, 164
 Callionymidae, 234
Callionymus, 234
 calliura, *Mycteroperca*, 100
calliurus, *Ioglossus*, 222
 callolepis, *Harengula*, 9
 camelopardalis, *Serranus*, 101
 canariensis, *Clinus*, 250
Cantherines, 289
Canthidermis, 288
Canthigaster, 300
 Canthigasteridae, 300
 capillatus, *Clinus*, 249
capistratus, *Chaetodon*, 147; pl. 20 f. 3
capricus, *Balistes*, 286
capros, *Antigonia*, 146
 Carangidae, 75
Caranx, 77
 Carapidae, 282
Carapus, 282
carbonarium, *Haemulon*, 124; pl. 14 f. 1
Carcharias, 2
 Carchariidae, 2
 Cardinal Fishes, 83
 cardinalis, *Serranus*, 99
caribaeum, *Branchiostoma*, 1
 carminale, *Tripterygium*, 246
carminatus, *Coelorhynchus*, 33
 carolinensis, *Balistes*, 286
carolinus, *Trachinotus*, 81
 Cat Sharks, 1
 cataphracts, *Trigla*, 167
 catesbaei, *Scarus*, 211
 catesby, *Scarus*, 211
caudalis, *Halichoeres*, 195
 caudalis, *Julis*, 195
 caudimacula, *Bembrops*, 237
 Caularchus, 283
Caulolatilus, 145
 cavalla, *Scomberomorus*, 71
 cayorum, *Corythoichthys*, 57
 cayorum, *Dinematichthys*, 277
 cayorum, *Ogilbia*, 277
 Centropomidae, 92
Centropomus, 92
Centropistes, 103
 Cephacandia, 174
 Cephalacanthus, 174
Cephalopholis, 92
 cephalus, *Gobiesox*, 283
cephalus, *Mugil*, 69
 Ceratacanthus, 291
 cervinum, *Lepophidium*, 281
Chaenopsis, 275
Chaetodon, 147
 Chaetodontidae, 147
 Chalinura, 32

- chalybeius*, *Chlorophthalmus*, 25
chancei, *Gobiosoma*, 227
chaperi, *Acanthoclinus*, 262
chaperi, *Paraclinus*, 262
Chaunacidae, 309
Chaunax, 309
chesteri, *Urophycis*, 38
Chilomycterus, 302
chloris, *Scarus*, 214
Chlorophthalmus, 25
chloropterus, *Plectropoma*, 98
Chloroscombrus, 76
chlorostomus, *Trisotropis*, 100
chlorurum, *Plectropoma*, 109
Chromis, 175
chrysargyreus, *Brachygenys*, 128; pl. 16 f. 1
chrysopterus, *Haemulon*, 123
chrysopterus, *Sparisoma*, 212
chrysopterus, *Scarus*, 212
chrysurus, *Chloroscombrus*, 76
chrysurus, *Glyphisodon*, 186
chrysurus, *Ocyurus*, 121; pl. 11 f. 2, pl. 12 f. 1, pl. 19 f. 2, pl. 32 f. 2
chrysurus, *Stegastes*, 186
chrysus, *Eupomacentrus*, 180
ciliaris, *Alectis*, 82
ciliaris, *Chaetodon*, 153
ciliaris, *Holacanthus*, 153
ciliaris, *Pomacanthus*, 153
ciliatus, *Monacanthus*, 294
cinereus, *Gerres*, 140
cinereus, *Mugil*, 140
cingulatus, *Pomacanthus*, 151
circumnotatus, *Scarus*, 214
cirratum, *Ginglymostoma*, 1
cirratus, *Phycis*, 37
cirrhosum, *Lepisoma*, 249, 250
Citharichthys, 43
Clingfishes, 283
Clupeidae, 5
clupeola, *Harengula*, 10
clupeola, *Sardinella*, 10
coccineus, *Scarus*, 207
Codfishes, 35
coelestinus, *Pseudoscarus*, 221
coelestinus, *Scarus*, 221
Coelorhynchus, 33
colesi, *Scorpaena*, 166
Common grunt, 126
Common spotted moray, 18
Coney, 92
Conger Eels, 17
Congridae, 17
conklini, *Amia*, 85
conklini, *Apogon*, 85
conspersus, *Serranus*, 93
consuelae, *Chaetodon*, 148
copei, *Xenodermichthys*, 14
corallinus, *Antennarius*, 305
coregonoides, *Sudis*, 24
Cornet Fishes, 67
cornutus, *Citharichthys*, 43
cornutus, *Holacanthus*, 153
cornutus, *Rhomboidichthys*, 43
coruscum, *Holocentrum*, 54
coruscus, *Holocentrus*, 54
Coryphaena, 74
Coryphaenidae, 74
Coryphopterus, 232
crassiceps, *Cryptotomus*, 205
cremnobates, *Labrosomus*, 257
cristatus, *Blennius*, 268
Croakers, 143
crocota, *Plectropoma*, 109
croicensis, *Scarus*, 218; pl. 29 f. 1
crotaphus, *Julis*, 194
cruentatus, *Petrometopon*, 92
cruentatus, *Priacanthus*, 112
crumenophthalma, *Trachurops*, 76
Cryptotomus, 205
crysos, *Caranx*, 79
cubensis, *Rupiscartes*, 270
cubifrons, *Lophius* (*Malthe*), 312
cubifrons, *Ogcocephalus*, 312; pl. 33 f. 2
culebrae, *Malacoctenus*, 258
curaçao, *Bathygobius*, 224
curema, *Mugil*, 69
Cutlass Fishes, 73
cyanophrys, *Psenes*, 75
cyanops, *Caulolatilus*, 145
Cyclopsetta, 42
Cyclothone, 15
Cynoglossidae, 49
Cypselurus, 31

D

- Dactylopteridae*, 174
Dactylopterus, 174
Dactyloscopidae, 245
Dasyatidae, 4
Davidia, 291
Decapterus, 75
Decodon, 188
decoratus, *Entomacrodus*, 269
decoratus, *Iridio*, 193
decoris, *Doratonotus*, 198

Deep-Water Catalufas, 113
 denegatus, Pomacentrus, 186
 dentex, Odontoscion, 143; pl. 20 f. 1
 diadema, Scarus, 216
 diaphana, Emblemariopsis, 273
 diaphana, Sternoptix, 16
 Diapterus, 138
 Dibranchus, 316
 Dicromita, 278
 diencaeus, Eupomacentrus, 178
 dilecta, Ancyloperca, 39
 dimidiatus, Serranus, 100
 Dinematchthys, 277
 Diodon, 301
 Diodontidae, 301
 diomedeanus, Symphurus, 49
 Diplacanthopoma, 279
 Diplectrum, 103
 Dipodus, 133
 dispar, Scorpaena, 160
 distinctum, Sparisoma, 208
 distinctus, Scarus, 208
 Dog snapper, 119
 Dogfishes, 3
 Dolphins, 74
 Doratonotus, 198
 dorsalis, Sphoeroides, 300
 dorsopunicus, Pomacentrus, 178
 Drums, 143
 dubia, Harengula, 10
 Dules, 107
 dumerili, Caranx, 76
 dumerili, Seriola, 76
 dunckeri, Syngnathus, 59
 Dussumieriidae, 12

E

Eagle Rays, 4
 Echelidae, 17
 Echeneidae, 234
 Echeneis, 234
 Echiostoma, 15
 egmontis, Myrophis, 17
 egregius, Execestides, 244
 egretta, Bellator, 173
 Elacatinus, 226
 elegans, Iridio, 192
 Eleotridae, 222
 elongatum, Sparisoma, 212
 Elopidae, 4
 Elops, 4
 elucens, Siphostoma, 60
 elucens, Syngnathus, 60, 61

emarginatum, Sparisoma, 208
 emarginatus, Scarus, 214
 Emblemaria, 273
 Emblemariopsis, 273
 emblematicus, Callyodon, 218
 encaeus, Gobius, 230
 enchrysurus, Chromis, 176
 Engraulidae, 12
 Engyophrys, 45
 Enneanectes, 246
 Enneapterygius, 246
 ephippium, Plectropoma, 109
 Epinephelus, 93
 Eques, 143
 Ericteis, 249
 erythrinoides, Scarus, 208
 Etmopterus, 3
 Etropus, 44
 Eucinostomus, 136
 Euleptorhamphus, 30
 Euthynnus, 72
 evermanni, Scarus, 218
 Evermannichthys, 229
 Eviota, 222
 evolans, Halocypselus, 31
 Execestides, 244
 Exocoetidae, 31

F

fajardo, Auchenopterus, 259
 falcata phenax, Mycteroperca, 100
 falcatus, Serranus, 100
 falcatus, Trachinotus, 80
 fasciata, Brannerella, 259
 fasciata, Seriola, 76
 fasciata, Starksia, 259
 fasciatum, Opisthognathus, 240
 fasciatus, Auchenopterus, 259, 262
 fasciatus, Cremonobates, 262
 favosus, Bathygadus, 32
 favosus, Blennius, 266
 felinus, Serranus, 101
 Filefishes, 289
 fimbriata, Cycloperca, 42
 Fistularia, 67
 Fistulariidae, 67
 Flatfishes, 38
 flavescens, Sparisoma, 209, 215
 flavicauda, Hyporthodus, 93
 flaviventer, Pomacentrus, 181
 flavolimbatus, Epinephelus, 93
 flavolineatum, Haemulon, 127
 flavolineatus, Pimeleperus, 135

flavomarginatus, Scarus, 216
flavo-vittatus, Upeneus, 141
floridae, Scorpaenodes, 166
floridae, Siphostoma, 63
floridae, Syngnathus, 63
floridanus, Cerdale, 276
floridanus, Microdesmus, 276
 Flounders, 38
 Flying Fishes, 31
 Flying Gurnards, 174
foetens, Synodus, 22
forcipatus, Balistes, 286
formosum, Diplectrum, 103
formosus, Holacanthus, 153
freemani, Pomacentrus, 180
frenatus, Iridio, 190
 French grunt, 127
 French margate fish, 125
 Frogfishes, 303
frondosum, Sparisoma, 214
frondosus, Scarus, 208
frontalis, Gastropsetta, 39
fucorum, Blennius, 266
fulvus, Cephalopholis, 92
fulvus, Labrus, 92
fulvus punctatus, Cephalopholis, 92
fulvus ruber, Cephalopholis, 92
funnebris, Gymnothorax, 19
furcatus, Cypselurus, 31
fuscus, Prionodes, 105
fuscus, Eupomacentrus, 178

G

Gadella, 35
Gadidae, 35
 Gag, 100
Galeocerdo, 2
garnoti, Halichoeres, 193
garnoti, Julis, 193
Gastropsetta, 39
gemma, Hypoplectrus, 110
Gempylidae, 72
Gempylus, 72
Gerres, 140
Gerridae, 135
gibba, Histrio, 303; pl. 34
Gillellus, 245
Gillias, 246
gillii, Neobythites, 280
Ginglymostoma, 1
Ginglymostomidae, 1
 Glass-eyed snapper, 112
glaucofraenum, Coryphopterus, 232; pl. 29 f. 2

glaucus, Chaetodon, 81
gloverensis, Amia, 85
gnathodus, Pseudoscarus, 219
Gnatholepis, 225
Gnathypops, 238
 Goatfishes, 141
Gobies, 224
Gobiesocidae, 283
Gobiesox, 283
Gobiidae, 224
gobio, Clinus, 249, 257
gobio, Gobioclinus, 257
gobio, Labrisomus, 257
Gobioclinus, 249
gobioides, Bembrops, 237
gobioides, Hypsicometes, 237
Gobionellus, 230
Gobiosoma, 228
Gonocephalus, 174
Gonostomidae, 15
goodei, Trachinotus, 81
gracile, Peristedion, 168
gracilis, Chaetodon, 149
grandicornis, Auchenopterus, 264
grandicornis, Scorpaena, 161, 162
 Grass porgy, 132
 Gray grunt, 123
 Gray Sharks, 2
 Gray snapper, 115
 Great barracuda, 69
griseus, Lutianus, 115; pl. 9 f. 1, pl. 13 f. 1
gronovii, Nomeus, 74
 Grunts, 122
Guacamaia, 220
guacamaia, Pseudoscarus, 220
guacamaia, Scarus, 220
Guativeri, 92
guentheriana, Alutera, 294
gula, Eucinostomus, 138
gula, Gerres, 138
gulula, Eucinostomus, 138
gummigutta, Plectropoma, 109
gunteri, Syacium, 41
guppyi, Clinus, 254
guppyi, Labrisomus, 254
guttatus, Epinephelus, 97
guttatus, Johnius, 98, 99
guttavarium, Plectropoma, 109
Gymnothorax, 18

H

Haemulidae, 122
Haemulon, 122

haitiensis, *Labrisomus*, 253
 Hakes, 35, 38
 Halfbeaks, 30
Halichoeres, 189
Halieutichthys, 315
Halocypselus, 31
 Hamlet, 95
 Hammerhead shark, 3
 Hammerhead Sharks, 3
 Hardhead, 68
 Hardtail, 79
Harengula, 8
harperi, *Tetrodon* (*Spheroides*), 300
havana, *Eucinostomus*, 140
havana, *Xystaema*, 140
heilneri, *Labrisomus*, 254, 255
Helicolenus, 165
Hemianthias, 111
Hemimblemaria, 275
 Hemiramphidae, 30
Hemiramphus, 30
hemphillii, *Stathmonotus*, 265
hepatus, *Acanthurus*, 156
hepatus, *Teuthis*, 156
Hepsetia, 68
hepsetus, *Anchoviella*, 12
herminier, *Blennius*, 249
herminier, *Clinus*, 254
 Herrings, 5
 Heterosomata, 38
hians, *Ablennes*, 29
hillianus, *Etmopterus*, 3
Hippichthys, 57
Hippocampus, 65
hippos, *Caranx*, 79
hippurus, *Coryphaena*, 74
hispidus, *Monacanthus*, 295
Histrio, 303
 Hogfish, 187
Holacanthus, 152
holacanthus, *Diodon*, 301
holbrookii, *Diplodus*, 133; pl. 17 f. 2
 Holocentridae, 53
Holocentrus, 53
hololepis, *Zenion*, 51
holotrachys, *Macrourus*, 33
homonymus, *Diapterus*, 138
hoplomystax, *Scarus*, 209
Hoplostethus, 53
 Horsefish, 82
horsti, *Elacatinus*, 227
horsti, *Gobiosoma*, 227
horsti, *Gobiosoma* (*Elacatinus*), 227
 Houndfish, 29

Houndfishes, 27
hudsonius, *Hippocampus*, 65
hudsonius punctulatus, *Hippocampus*, 65
humeralis, *Clupea*, 10
humeralis, *Harengula*, 10
humeralis, *Sardinella*, 10
Hymenocephalus, 34
Hypleurochilus, 268
Hypoplectrus, 108
Hypoprion, 2
Hyporhamphus, 30
Hypsicometes, 237
hystrix, *Diodon*, 301

I

ilucoeteoides, *Dinematichthys*, 277
imberbe, *Peristedion*, 167, 168
imberbe, *Pterystedion*, 168
incisor, *Kyphosus*, 135
incisor, *Pimelepterus*, 135
inermis, *Scorpaena*, 162
infirmus, *Xyrichtys*, 203
insolatus, *Chromis*, 176
insulae-sanctae-crucis, *Scarus*, 218
intermedius, *Synodus*, 21
interstitialis, *Mycteroperca*, 100
interstitialis, *Serranus*, 100
Ioglossus, 222
irideus, *Halichoeres*, 192
isabelita, *Holacanthus*, 154
 Istiophoridae, 74
Istiophorus, 74
itaiaia, *Promicrops*, 97

J

jacobus, *Myripristis*, 55
jaguana, *Harengula*, 9
 Jawfishes, 238
Jenkinsia, 12
jessiae, *Xyrichtys*, 199
jessiae, *Xyrula*, 188
 Jewfish, 97
jocu, *Lutianus*, 119; pl. 10 f. 2, pl. 11 f. 1
 John Dories, 50
jonesi, *Syngnathus*, 58
jonesii, *Gerres*, 139
jordani, *Enneapterygius*, 246
jordani, *Gillias*, 246

K

kalisherae, *Erieteis*, 249, 252
kalisherae, *Labrisomus*, 252

Kathetostoma, 245
kaupii, *Synaphobranchus*, 16
kendalli, *Calamus*, 131
kincaidi, *Hippocampus*, 65
 Kingfish, 71
kirschii, *Iridio*, 194
Kyphosidae, 134
Kyphosus, 134

L

Labridae, 187
Labrisomus, 249
Lachnolaimus, 187
lacrimosus, *Scarus*, 209
Lactophrys, 297
 Ladyfishes, 5
Laemonema, 36
laevigatus, *Lagocephalus*, 299
Lagocephalus, 299
Lagodon, 133
lalandi, *Seriola*, 76
lamprotaenia, *Clupea*, 12
lamprotaenia, *Jenkinsia*, 12
 Lancelets, 1
lanceolatus, *Eques*, 143
 Lane snapper, 120
 Lantern Fishes, 26
lateralis, *Scarus*, 212
laticeps, *Benthoscopus*, 244
latus, *Caranx*, 78
 Leatherjacket, 83, 286
lefroyi, *Diapterus*, 136, 137
lefroyi, *Eucinostomus*, 137
lentiginosus, *Labrisomus*, 250
 Leopard shark, 2
Lepisoma, 249
Lepophidium, 281
leucostictus, *Pomacentrus*, 181
lightfooti, *Epinephelus*, 98
lineatus, *Calliodon*, 218
lineatus, *Triacanthodes*, 285
lineatus, *Xyrichthys*, 203
lineolatus, *Pseudoscarus*, 218
Liopropoma, 101
 Little tunny, 72
littoralis, *Menticirrhus*, 143
littorcola, *Chaetodon*, 151
 Lizard Fishes, 20
Lobotes, 115
Lobotidae, 115
Lonchopisthus, 243
lonchurus, *Opisthognathus*, 239
longispathum, *Peristedion*, 169

longispinis, *Pontinus*, 166
longleyi, *Strongylura*, 27
longleyi, *Syacium*, 41
longum, *Gobiosoma*, 228
Lophiidae, 303
Lophius, 303
lorito, *Sparisoma*, 212
louisianae, *Syngnathus*, 64
lowei, *Polymixia*, 52
lugubris, *Caranx*, 78
lugubris, *Malacotenus*, 259
lutescens, *Chaetodon*, 151
luteus, *Chaetodon*, 152
Lutianidae, 115
Lutianus, 115

M

macclurei, *Alticus*, 270
macclurei, *Rupiscartes*, 270
mackayi, *Siphostoma*, 63
 Mackerels, 71
macrocephalus, *Gonocephalus*, 174
macrodon, *Gobiosoma*, 227
macrodon, *Tigriogobius*, 227
macrolepidotus, *Neoscopelus*, 26
macrophthalmus, *Clupea*, 10
macrophthalmus, *Harengula*, 10
macrophthalmus, *Harengula*, 9
macrophthalmus, *Pristipomoides*, 122
macrophthalmus, *Sardinella*, 9, 10
macrops, *Calamus*, 131
macrops, *Citharichthys*, 43
macropus, *Malacotenus*, 247
macropus, *Myxodes*, 247
Macrorhamphosidae, 67
Macrorhamphosus, 67
macrostomum, *Haemulon*, 123; pl. 12 f. 2
Macrouridae, 32
Macrourus, 33
maculatus, *Apogon*, 87; pl. 3 f. 1
maculatus, *Aulostomus*, 66; pl. 1 f. 1, 2
maculatus, *Monoprion*, 87
maculatus, *Pseudupeneus*, 142; pl. 19 f. 1, 2
maculatus, *Scomberomorus*, 71
maculiferus, *Hypoplectrus*, 109
maculipinna, *Halichoeres*, 190
maculipinna, *Julis*, 190
maculocinctus, *Sarothrodus*, 149
maculosa, *Harengula*, 9
maderensis, *Helicolenus*, 165
maeandricus, *Lepadogaster*, 283
Malacanthidae, 145

- Malacanthus**, 145
Malacotenus, 247
 malarmat, Peristedion, 167
 Man-of-war Fishes, 74
 Mangrove snapper, 115
maraldi, Gadella, 35
 margarita, Callyodon, 218
 margaritaceus, Salarias, 269
 margaritifera, Serranus, 93
 Margate fish, 122
 marginatus, Chaetodon, 183
marmoratus, Auchenopterus, 261
 marmoratus, Gobiosoma, 283
 marmoratus, Sphaeroides, 300
marmoreus, Blennius, 266
martinicensis, Ocyanthias, 108
martinicensis, Xyrichtys, 203
martinicus, Mulloidichthys, 141; pl. 18 f. 1, 2
 martinicus, Upeneus, 141
 maschalespilos, Scarus, 212
 mauritii, Chaetodon, 184
 maxillosa, Gnathypops, 242
 maxillosus, Opisthognathus, 238, 240
maximus, Lachnolaimus, 187; pl. 25 f. 1, 2
mediterraneus, Hoplostethus, 53
 meeki, Eucinostomus, 137
 megacephalus, Calamus, 131
megalepis, Doratonotus, 198
 Megaphalus, 283
 melampodus, Apogonichthys, 90
 Melanostomiidae, 15
 melanotis, Scarus, 211
melanurum, Haemulon, 125
Menticirrhus, 143
 Merlucciidae, 38
Merluccius, 38
mesogaster, Parexocoetus, 31
metzelaari, Evermannichthys, 229
 metzelaari, Kyphosus, 134
 meyeri, Iridio, 190
 Microdesmidae, 276
Microdesmus, 276
 microdon, Cyclothone, 15
 micrognathus, Lonchopisthus, 243
Microgobius, 228, 233
 microlepidotus, Labrisomus, 250
 microlepis, Microgobius, 234
 microlepis, Mycteroperca, 100
 microlepis, Prionotus, 173
 micronemus, Peristedion, 168
 microstomus, Blennius, 268
 microstomus, Iridio, 190
 militaris, Bellator, 173
miniatus, Peristedion, 169
 modestus, Xyrichtys, 203
 Mojarra blanca, 140
 Mojarra, 135
 Monacanthidae, 289
Monacanthus, 294
 monoceros, Balistes, 291
Monolene, 46
monophthalmus, Auchenopterus, 263
 Moonfish, 82
 moorei, Malacotenus, 247
 Morays, 18
 moribundus, Balistes, 286
moringa, Gymnothorax, 18
morio, Epinephelus, 96; pl. 4 f. 2, pl. 5 f. 1, 2
 moucharra, Glyphisodon, 184
 mowbrayi, Eucinostomus, 140
 mowbrayi, Haemulon, 123
Mugil, 69
 Mugilidae, 69
 mülleri, Pempheris, 113
 Mulletts, 69
 Mullidae, 141
Mulloidichthys, 141
 multifasciatum, Gobiosoma, 227
multilineatus, Chromis, 175
multicellatus, Antennarius, 305
 multicellatus, Chironectes, 305
 Muraenidae, 18
 Muttonfish, 119
Mycteroperca, 98
 Myctophidae, 26
 Myliobatidae, 4
myops, Trachinocephalus, 20
Myrichtys, 18
Myripristis, 55
Myrophis, 17
 mystacinus, Epinephelus, 94
 mystacinus, Gnathypops, 239

N

- narinari, Aetobatus, 4
 Nassau grouper, 95
nasutus, Ogcocephalus, 312
naucrates, Echineis, 234
 nebularis, Platyphrys, 47
 Needlefishes, 27
Neobythites, 280
Neomerinthe, 166
Neoscopelus, 26
 nepenthe, Pomacentrus, 181

Nicholsina, 205
 Niggerfish, 92
 nigricans, *Entomacrodus*, 269
 nigricans, *Plectropoma*, 109
 nigripinnis, *Auchenopterus*, 259
 nigripinnis, *Clinus*, 259
 nigropunctatus, *Prionodes*, 107
 niphobles, *Sparisoma*, 209
 nitida, *Julis*, 196
 nitidissima, *Julis*, 196
 niveatus, *Epinephelus*, 93
 niveatus, *Pomacentrus*, 186
 niveatus, *Serranus*, 93
Nodogymnus, 48
 Nomeidae, 74
Nomeus, 74
 normani, *Saurida*, 24
 notata, *Strongylura*, 27
 notospilus, *Prionodes*, 105
 notospilus, *Serranus*, 105
 nox, *Auchenopterus*, 262
 nuchipinnis, *Clinus*, 249
 nuchipinnis, *Labrisomus*, 249, 253, 254;
 pl. 30 f. 2
 Nurse Sharks, 1
 nuttingii, *Chaunax*, 309

O

oblongus, *Paralichthys*, 39
 obscuratus, *Pomacentrus*, 178
 obscurus, *Carcharias*, 2
 occidentalis, *Chalinura*, 32
 occipitalis, *Scorpaena*, 162
 oceanops, *Elacatinus*, 226
 ocellata, *Starksia*, 258
 ocellata, *Zenopsis*, 50
 ocellatus, *Bothus*, 47
 ocellatus, *Chaenopsis*, 275
 ocellatus, *Chaetodon*, 149; pl. 21 f. 1, 2
 ocellatus, *Clinus*, 257, 258
 ocellatus, *Gymnothorax*, 19
 ocellatus, *Rhombus*, 47
Ocyanthias, 108
Ocyurus, 121
 ocyurus, *Serranus*, 103
Odontoscion, 143
Ogcocephalidae, 311
Ogcocephalus, 315
Ogilbia, 277
 olfax, *Serranus*, 98
Oligoplites, 83
Ophichthyidae, 18
Ophidiidae, 281

ophryas, *Prionotus*, 172
Opisthognathidae, 238
Opisthognathus, 238
 ornata, *Raja*, 4
 ornatus, *Tetrodon*, 300
Osbeckia, 291
Ostraciidae, 297
 oxybrachius, *Scarus*, 208

P

pachycephalum, *Sparisoma*, 215; pl. 28
 f. 2
 palometa, *Trachinotus*, 81
 palometa, *Trachinotus*, 81
 pandionis, *Emblemaria*, 273
 papillosum, *Syacium*, 40
Paralichthys, 39
Paratriacanthodes, 285
Parexocoetus, 31
 parmatius, *Setarches*, 166
 parra, *Haemulon*, 124; pl. 13 f. 1, 2, pl.
 14 f. 1
 parrae, *Chaetodon*, 153
 Parrot Fishes, 205
 partitus, *Pomacentrus*, 180
 paru, *Chaetodon*, 151
 parvus, *Ogcocephalus*, 314
 parvus, *Upeneus*, 142
 pawnee, *Hepatus*, 156
 pectinifer, *Clinus*, 249
Pempheridae, 113
Pempheris, 113
 penrosei, *Halichoeres*, 190
 pensacola, *Harengula*, 10
 perfasciata, *Anchoviella*, 13
Peristediidae, 167
Peristedion, 167
 Permit, 81
 personata, *Eviota*, 222
Petrometopon, 92
 petrosus, *Serranus*, 99
 phenax, *Mycteroperca falcata*, 100
 philadelphica, *Perca*, 103
 philadelphicus, *Centropristes*, 103
 phoebe, *Prionodes*, 105
 Phycis, 37
 pictus, *Chaunax*, 309
 pictus, *Iridio*, 195
 pictus, *Julis*, 195
 picudilla, *Sphyræna*, 70
 pigmentarius, *Apogon*, 84, 86
 pilicornis, *Blennius*, 266
 Pinfish, 133

pinnavarius, Hypoplectrus, 109
 Pipefishes, 55
 pipulus, Syngnathus, 60
 pirapeda, Dactylopterus, 174
 piscatorius, Lophius, 303
 planifrons, Apogon, 89
 planifrons, Pomacentrus, 180
 platycephalum, Peristedion, 170
 platyrhynchus, Bathypercis, 237
 pleianus, Scarus, 220
 Pleuronectidae, 48
 pleurophthalmus, Antennarius, 308
 plumbeus, Pseudoscarus, 221
 plumieri, Haemulon, 126; pl. 14 f. 2, pl. 15 f. 1, 2
 plumieri, Malacanthus, 145
 plumieri, Scorpaena, 159; pl. 23 f. 1, 2
 plutonia, Raja, 4
 Poecilopsetta, 48
 poeyi, Halichoeres, 194
 poeyi, Platy glossus, 194
 poeyi, Synodus, 21
 Polymixia, 52
 Polymixiidae, 52
 Pomacanthus, 151
 Pomacentridae, 175
 Pomacentrus, 177
 Pompano, 80
 Pompanos, 75
 Pontinus, 166
 Porcupine Fishes, 301
 Porgies, 130
 Porichthys, 283
 Porkfish, 129
 porosissimus, Porichthys, 283
 powelli, Balistes, 286
 Priacanthidae, 112
 Priacanthus, 112
 Prionodes, 105
 Prionotus, 171
 Pristipomoides, 122
 probatocephalus, Archosargus, 134
 productus, Eucinostomus, 137
 profundorum, Lepophidium, 281
 Promicrops, 97
 Promyllantor, 17
 Pronotogrammus, 111
 Psenes, 75
 pseudogula, Eucinostomus, 139
 pseudohispanica, Clupea, 6
 pseudohispanica, Sardinia, 5, 6
 pseudohispanicus, Clupanodon, 6
 pseudomaculatus, Apogon, 88
 Pseudopriacanthus, 113

Pseudoscarus, 220
 Pseudupeneus, 142
 psittacus, Callyodon, 211
 psittacus, Coryphaena, 199
 psittacus, Xyrichthys, 199; pl. 26 f. 2
 Pteropsaridae, 237
 Puddingwife, 192
 puella, Hypoplectrus, 109
 puella, Plectropoma, 109
 puellaris, Cossyphus, 188
 puellaris, Decodon, 188
 Puffers, 299
 pulcher, Eques, 144
 pullus, Cantherines, 289
 punctata, Alutera, 291
 punctata, Alutera (Ceratacanthus), 291
 punctata, Perca, 92
 punctatus, Cephalopholis fulvus, 92
 punctatus, Decapterus, 75
 puncticulatus, Apogonichthys, 90
 puncticulatus, Holocentrus, 54
 punctulatus, Hippocampus, 65
 punctulatus, Hippocampus hudsonius, 65
 punctulatus, Scarus, 216
 Purple-mouthed moray, 19
 pusillus, Enneapterygius, 246
 pusillus, Symphurus, 50

Q

quadrifilis, Bathypterois, 25
 quadrisquamatus, Apogon, 87
 Queen angelfish, 153
 Queen triggerfish, 288
 quinquecinctus, Pomacanthus, 151

R

radiale, Diplectrum, 104
 radians, Scarus, 209
 radians, Sparisoma, 209
 radiatus, Halichoeres, 192
 radiatus, Labrus, 192
 radiatus, Lophius, 312
 radiosus, Antennarius, 305
 Raja, 4
 Rajidae, 4
 raphidoma, Strongylura, 29
 rathbuni, Pomacanthus, 152
 Rattails, 32
 Rays, 4
 Razor fish, 199
 Red goatfish, 142
 Red grouper, 96

Red hind, 97
 Red parrot fish, 207
regalis, *Scomberomorus*, 71
regius, *Urophycis*, 37
Remora, 234
remora, *Remora*, 234
Remoras, 234
reticulatus, *Trisotropis*, 101
retifer, *Scylliorhinus*, 1
retractus, *Cryptotomus*, 201
retrospinis, *Paratriacanthodes*, 285
Rhegma, 112
rhomaleum, *Sparisoma*, 211
rhomboides, *Lagodon*, 133
Rhomboplites, 121
rimator, *Bathystoma*, 127
rimosus, *Etropus*, 45
Risor, 228
rivulatus, *Serranus*, 101
robertsi, *Syngnathus*, 60
 Rock hind, 93
roseus, *Cryptotomus*, 205
rosipes, *Novaculichthys*, 201
rosipes, *Xyrichthys*, 203
rostratus, *Canthigaster*, 300
rostratus, *Scarus*, 221
rostratus, *Tetrodon*, 300
 Round Herrings, 12
rousseau, *Syngnathus*, 62
ruber, *Caranx*, 77; pl. 2 f. 3
ruber, *Cephalopholis fulvus*, 92
ruber, *Gymnocephalus*, 92
ruber, *Risor*, 228
rubescens, *Auchenopterus*, 259
rubicundus, *Auchenopterus*, 259
rubra, *Garmannia*, 228
rubra, *Garmannia* (*Risor*), 229
rubridorsalis, *Eupomacentrus*, 178
rubripinne, *Sparisoma*, 214
rubripinnis, *Scarus*, 214
rubrocinctus, *Gillellus*, 246
 Rudder Fishes, 134
rudis, *Glyphisodon*, 185
rufus, *Bodianus*, 189
 Runner, 77
rupestris, *Serranus*, 99
Rupiscartes, 270
russula atlantica, *Scorpaena*, 164
Rypticus, 102

S

Sailfishes, 74
 Sailor's choice, 124
Salarichthys, 269

sancti eustatii, *Callionymus*, 236
 Sand Stargazers, 245
sanguineus, *Sicyases*, 283
saponaceus, *Rypticus*, 102
sardina, *Harengula*, 9
sardina, *Sardinella*, 9
Sardinella, 5
Sardinia, 5
Sargassum fish, 303
sargoides, *Chaetodon*, 184
 Saucer-eye porgy, 131
Saurida, 23
saurus, *Elops*, 4
saurus, *Oligoplites*, 83
saxatilis, *Abudefduf*, 183; pl. 24 f. 1
saxatilis, *Chaetodon*, 183
scaber, *Antennarius*, 304
Scaridae, 205
Scarus, 216
schmitti, *Promyllantor*, 17
schoepfi, *Chilomycterus*, 302
schoepfii, *Alutera*, 291
schoepfii, *Balistes*, 291
schomburgkii, *Pempheris*, 113
 Schoolmaster, 118
Sciaenidae, 143
sciurus, *Haemulon*, 125; pl. 13 f. 1, 2,
 pl. 14 f. 2, pl. 15 f. 1, 2, pl. 18, f. 1, 2
Scoliodon, 2
scolopax, *Macrorhamphosus*, 67
Scomberomorus, 71
Scombridae, 71
Scorpaena, 159
Scorpaenidae, 157
Scorpaenodes, 166
 Scorpion Fishes, 157
scripta, *Alutera*, 293
scriptus, *Balistes*, 291, 293
Scylliorhinidae, 1
Scylliorhinus, 1
 Sea Basses, 92
 Sea Horses, 55
 Sea Robins, 170
sectatrix, *Kyphosus*, 134
sectatrix, *Perca*, 134
sedentarius, *Chaetodon*, 149
Selene, 82
sellicauda, *Apogon*, 87
semicinctus, *Gillellus*, 245
sentus, *Engyophrys*, 45
 Sergeant major, 183
Seriola, 76
serpens, *Gempylus*, 72
Serranidae, 92

- Serranus, 107
 setapinnis, Vomer, 82
 Setarches, 166
 Sharp-nosed Puffers, 300
 Sharp-nosed shark, 2
 Sheepshhead, 134
 siccifer, Holocentrus, 54
 sicciferum, Holocentrum, 54
 Sicyases, 283
 Sicyogaster, 283
 signatus, Microgobius, 233
 Silversides, 68
 similis, Iridio, 190
 simplex, Pseudoscarus, 221
 simulus, Hemimblemaria, 275
 Skates, 4
 Slippery dick, 191
 sloani, Urobatis, 4
 Snake Eels, 18
 Snake Mackerels, 72
 Snappers, 115
 Snipefishes, 67
 Snooks, 92
 Soapfishes, 102
 sonnerati, Opisthognathus, 238
 sporator, Bathygobius, 224
 Spanish grunt, 123
 Spanish hogfish, 189
 Spanish mackerel, 71
 Sparidae, 130
 Sparisoma, 207
 spengleri, Sphoeroides, 299
 Sphoeroides, 299
 Sphyraena, 69
 Sphyraenidae, 69
 Sphyrna, 3
 Sphyrnidae, 3
 spinarella, Cephalacanthus, 174
 spinidens, Scarus, 211
 spinidens, Sparisoma, 211
 spiniger, Peristedion, 170
 spinosa, Acanthemblemaria, 272
 spinosus, Rhomboidichthys, 47
 splendens, Xyrichthys, 201
 spleniatum, Pristipoma, 129
 spongicola, Evermannichthys, 229
 Spot-tail pinfish, 133
 Spotted eagle ray, 4
 Spotted moray, 19
 Squalidae, 3
 Squalus, 3
 squamilentus, Paralichthys, 39
 squamipinnis, Gerres, 140
 squamulosus, Chaetodon, 153
 Squirrelfishes, 53
 stahli, Auchenistius, 264
 Stargazers, 244
 Starksia, 257
 Stathmonotus, 265
 stearnsi, Blennius, 266
 stearnsi, Prionotus, 171
 Stegastes, 186
 stellatus, Apogonichthys, 90
 Sternoptichidae, 16
 Sternoptix, 16
 stigmaticus, Gobionellus, 230
 Sting Rays, 4
 stipes, Hepsetia, 68
 stolifera, Dussumieria, 12
 striata, Alausa, 10
 striata, Argentina, 14
 striatum, Bathystoma, 128
 striatus, Chaetodon, 148
 striatus, Epinephelus, 95; pl. 3 f. 2, pl. 4 f. 1
 strombi, Apogonichthys, 90
 Strongylura, 27
 strumosus, Gobiesox, 284
 stylifer, Hippocampus, 65
 subfurcatus, Bermudichthys, 196
 subligarius, Dules, 107
 Sudidae, 24
 Sudis, 24
 Surgeonfishes, 154
 surinamensis, Anisotremus, 129
 surinamensis, Lobotes, 115; pl. 8 f. 2
 Surmulletts, 141
 Syacium, 40
 Symphurus, 49
 synagris, Lutianus, 120
 Synagrops, 91
 Synaphobranchidae, 16
 Synaphobranchus, 16
 Syngnathidae, 55
 Syngnathus, 58
 Synodontidae, 20
 Synodus, 21
 synodus, Synodus, 22

T

- tabacaria, Fistularia, 67
 taeniopterus, Pseudoscarus, 216
 Tarpon, 5
 Tarpon, 5
 Tarpons, 4
 taurus, Abudedefduf, 185; pl. 24 f. 2
 taurus, Glyphisodon, 185

tekla, *Stathmonotus*, 264
 Ten-pounder, 4
 Ten-pounders, 4
terrae-novae, *Scoliodon*, 2
Tetraodontidae, 299
textilis, *Salarias*, 269
textilis, *Salarichthys*, 269
Thalassoma, 196
thompsoni, *Gnatholepis*, 225
 Threadfin, 82
tiburo, *Sphyrna*, 3
 Tiger shark, 2
Tigriobius, 227
tigrinus, *Galeocerdo*, 2
tigris, *Mycteroperca*, 101; pl. 8 f. 1
tigris, *Serranus*, 101
timucu, *Strongylura*, 28
 Toadfishes, 283
 Tomtate, 127
 Tonguefishes, 49
tortugae, *Ctenogobius*, 232
tortugae, *Holocentrus*, 54
tortugae, *Neomerinthe*, 166
tortugarum, *Serranus*, 107
Trachichthyidae, 53
Trachinocephalus, 20
Trachinotus, 80
Trachurops, 76
translucens, *Gobius*, 232
Triacanthidae, 285
Triacanthodes, 285
Trichopsetta, 45
Trichuridae, 73
tricolor, *Chaetodon*, 152
tricolor, *Holacanthus*, 152
tricornis, *Lactophrys*, 298
 Triggerfishes, 286
Triglidae, 170
trigonus, *Lactophrys*, 298
 Tripletails, 115
triqueter, *Lactophrys*, 297; pl. 32 f. 1, 2
Trisotropis, 98
truculentus, *Chlorophthalmus*, 26
 Trumpet Fishes, 66
truncatus, *Blennius*, 270
truncatus, *Scarus*, 214
 Trunkfishes, 297
tuckeri, *Monacanthus*, 296
 Tunas, 71
turchesius, *Scarus*, 220

U

Ulaema, 136
undecimalis, *Centropomus*, 92

unicornis, *Citharichthys*, 43
unifasciatus, *Hyporhamphus*, 30
Upeneus, 142
Uranoscopidae, 244
Urobatis, 4
Urophycis, 37
ustus, *Cryptotomus*, 206

V

Vacas, 108
vanderbilti, *Pristipomoides*, 109
variegata, *Acanthemblemaria*, 272
veliger, *Histioclinus*, 264
velox, *Euleptorhamphus*, 30
venenosa, *Mycteroperca*, 99; pl. 6 f. 1, 2
 pl. 7 f. 1, 2
venenosa, *Perca*, 98, 99
venenosa apua, *Mycteroperca*, 99
ventralis, *Alutera*, 293
ventralis, *Trichopsetta*, 45
ventralis, *Xyrichthys*, 201
venustus, *Xyrichthys*, 201, 203
vermiculatus, *Xyrichthys*, 199
verillii, *Brosomphycis*, 277
verrucosus, *Antennarius*, 306
versicolor, *Malacoctenus*, 248
vespertilio, *Ogcocephalus*, 314
vetula, *Balistes*, 288; pl. 33 f. 1
vexillarium, *Holocentrus*, 54
vexillarius, *Holocentrus*, 54
vicinus, *Gymnothorax*, 19
virens, *Scarus*, 214
virgatulus, *Gobiesox*, 284
virginicus, *Anisotremus*, 129; pl. 2 f. 3,
 pl. 16 f. 2
virginicus, *Sparus*, 129
viride, *Sparisoma*, 211
viridensis, *Bathyporeus*, 25
viridis, *Scarus*, 211
vivanus, *Hemianthias*, 111
vivanus, *Lutianus*, 120
volitans, *Dactylopterus*, 175
volitans, *Trigla*, 174
Vomer, 82
vomer, *Selene*, 82
vulpes, *Albula*, 5
Vulsiculus, 167

W

weberi, *Xenogobius*, 233
 White chub, 134
whitehurstii, *Gnathypops*, 242

whitehurstii, *Opisthognathus*, 242
williamsoni, *Nodogymnus*, 48
Worm Eels, 17

X

xanthurus, *Pomacentrus*, 181
Xenodermichthys, 14
Xenogobius, 233
Xyrichthys, 199
xystrodon, *Sparisoma*, 209

Y

Yarella, 15
Yellow chub, 135

Yellow-fin grouper, 99
Yellow goatfish, 141
Yellow grunt, 125
Yellow jack, 78
Yellowtail, 121

Z

zebra, *Gerres*, 140
zebra, *Triacanthodes*, 285
Zeidae, 50
Zenion, 51
Zenopsis, 50
zygaena, *Sphyrna*, 3



FIG. 1. *Aulostomus maculatus*, trumpet fish, hiding through mimicry in a sea feather, *Gorgonia acerosa*.



FIG. 2. *Aulostomus maculatus*, trumpet fish, resting with head downward in a sea feather, *Gorgonia acerosa*, where it cannot readily be seen.



FIG. 1. *Holocentrus ascensionis*, squirrelfish, darting into a shelter of staghorn coral.



FIG. 2. *Sphyracna barracuda*, great barracuda.



FIG. 3. *Caranx ruber*, runners (two largest fish in picture). *Anisotremus virginicus*, porkfish, apparently inspecting runner for parasites. Another porkfish and two tangs, *Acanthurus* sp., in foreground.



FIG. 1. *Apogon maculatus*. Details of stripe through eye. (From original in color, painted from life by Manson Valentine.)



FIG. 2. *Epinephelus striatus*, Nassau grouper, with dark bands, but otherwise light, in harmony with background.



FIG. 1. *Epinephelus striatus*, Nassau grouper. Notice tuning-fork arrangement of stripes on head.



FIG. 2. *Epinephelus morio*, red grouper. In color it is one of the most changeable fishes. Note dark margin of caudal fin.



FIG. 1. *Epinephelus morio*, red grouper, in a rather plain speckled swimming color phase.



FIG. 2. *Epinephelus morio*, red grouper, in a very plain color phase, which it generally assumes when active.



FIG. 1. *Mycteroperca venenosa*, yellow-fin grouper, in a dark color phase though over white bottom.



FIG. 2. *Mycteroperca venenosa*, yellow-fin grouper, in a light color phase. This species attains a larger size locally than any other grouper except the jewfish, *Promicrops itaiara*.



FIG. 1. *Mycteroperca venenosa*, yellow-fin grouper, with dark spots on back only.



FIG. 2. *Mycteroperca venenosa*, yellow-fin grouper, in a very pale color phase with the usual dark blotches broken up into smaller dots.



FIG. 1. *Mycteroperca tigris* in great reef patch at north end of Loggerhead bank.

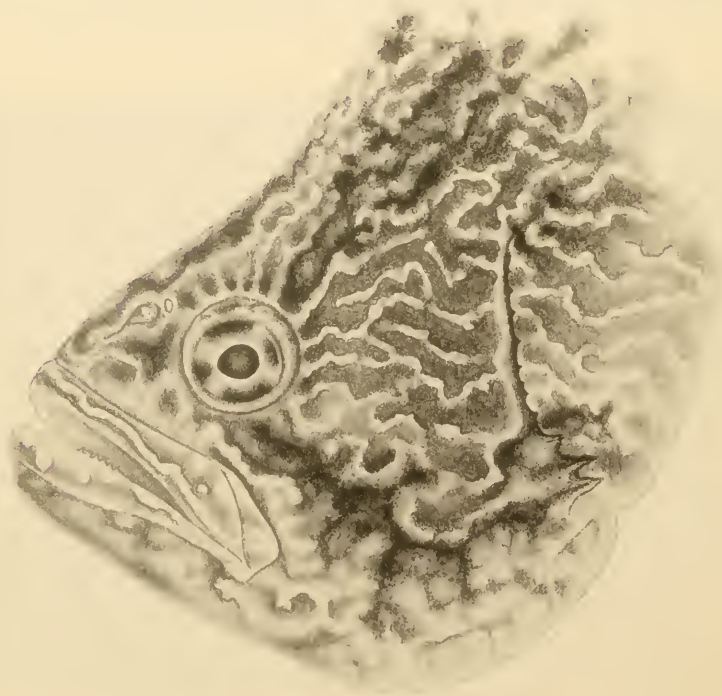


FIG. 2. *Lobotes surinamensis*, tripletail. Details of markings on side of head of young. (From original in color, painted from life by Manson Valentine.)



FIG. 1. *Lutianus griseus*, gray snappers, in their usual daytime habitat, among corals and sea fans.



FIG. 2. *Lutianus apodus*, schoolmasters, spending the day among coral heads.



FIG. 1. *Lutianus analis*, muttonfish, in banded color phase.



FIG. 2. *Lutianus jocu*, dog snapper, among corals, where this nocturnal feeder commonly spends the day.



FIG. 1. *Lutianus jocu*, dog snappers, among corals and gorgonians.



FIG. 2. *Ocyurus chrysurus*, yellowtail, in light spotted phase.



FIG. 1. *Ocyurus chrysurus*, yellowtails, feeding on a sea urchin crushed for them by Dr. Longley. Slippery dicks, *Halichoeres bivittatus*, in foreground.



FIG. 2. *Haemulon macrostomum*, Spanish grunt, a night feeder, like the other local species of the genus, idling the day away among the corals.



FIG. 1. *Haemulon parra*, sailor's choice. *Haemulon sciurus*, yellow grunt, in background, and snappers, *Lutianus griseus*, entering from left.



FIG. 2. *Haemulon parra*, sailor's choice, surrounded by *Haemulon sciurus*, yellow grunts.



FIG. 1. *Haemulon carbonarium*, Caesar grunt (center), with several *Haemulon parra*, sailor's choice.



FIG. 2. *Haemulon sciurus*, yellow grunts, and *Haemulon plumieri*, common grunt (front, slightly to left), among gorgonians.



FIG. 1. *Haemulon plumieri*, common grunt, and *Haemulon sciurus*, yellow grunt (to right), among gorgonians.



FIG. 2. *Haemulon plumieri*, common grunts, among corals and gorgonians. *Haemulon sciurus*, yellow grunt, in background.



FIG. 1. *Brachygenys chrysargyreus*, small fish of the grunt family, spending the day under a great gorgonian.



FIG. 2. *Anisotremus virginicus*, porkfish, about a great coral stack, a common daytime habitat of this nocturnal feeder.



FIG. 1. *Calamus* sp., probably the saucer-eye porgy, *calamus*, with a few slippery dicks, *Halichoeres bivittatus*, in the foreground.



FIG. 2. *Diplodus holbrookii*, spot-tail pinfish.



FIG. 1. *Mulloidichthys martinicus*, yellow goatfish. *Haemulon sciurus*, yellow grunt, out of focus at bottom.



FIG. 2. *Mulloidichthys martinicus*, yellow goatfish. *Haemulon sciurus*, yellow grunt, in foreground.



FIG. 1. *Pseudupeneus maculatus*, red goatfish. This fish feeds by day, and is commonly seen probing in loose sand with its sensitive barbels for the small animals on which it subsists.



FIG. 2. *Pseudupeneus maculatus*, red goatfish (lower left), digging for food, with *Ocyurus chrysurus*, yellowtail (upper), a parrot fish, *Scarus* sp. (left center), and a slippery dick, *Halichoeres bivittatus* (right center), ready to seize any animal rooted out that may escape the goatfish.



FIG. 1. *Odontoscion dentex*, a sciaenid.



FIG. 2. *Eques acuminatus*, lateral and anterodorsal views. (Drawings by Manson Valentine.)



FIG. 3. *Chaetodon capistratus*, lateral and dorsal views of ocular band. (Drawings by Manson Valentine.)

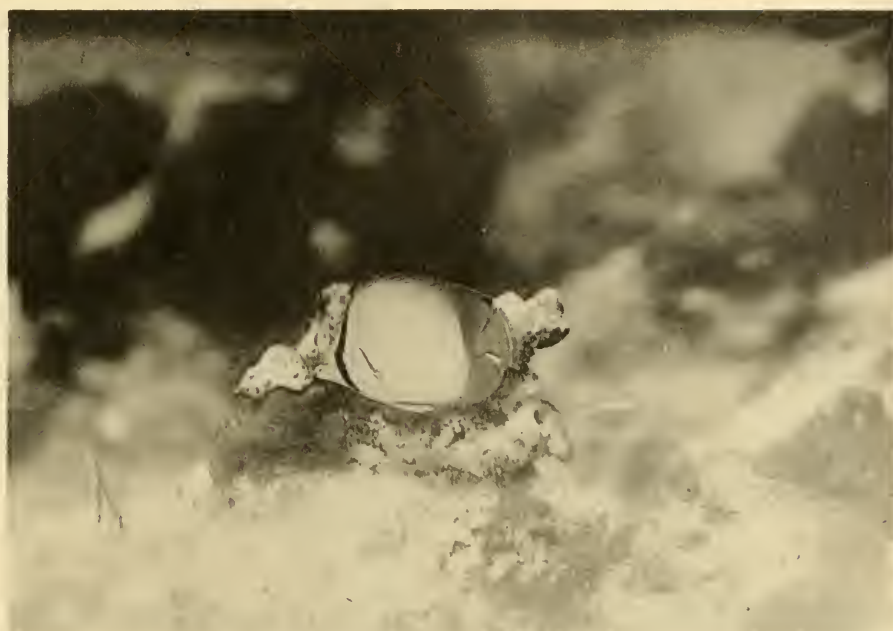


FIG. 1. *Chaetodon ocellatus*, butterfly fish, adult.



FIG. 2. *Chaetodon ocellatus*, butterfly fish, juveniles, with partly hidden tang, *Acanthurus* sp.



FIG. 1. *Pomacanthus aureus*, black angelfish, still showing slightly the banded pattern of the young.



FIG. 2. *Pomacanthus aureus*, black angelfish, adult, in pale color phase.



FIG. 1. *Scorpaena plumieri*, a scorpion fish. Details of markings on side of head. The general color of the head is carried over the margin of the eye to the pupil. (From original in color, painted from life by Manson Valentine.)



FIG. 2. *Scorpaena plumieri*, a scorpion fish (center), a good example of adaptation both as to color and as to pattern of background. A snapper, *Lutianus* sp., in background above.

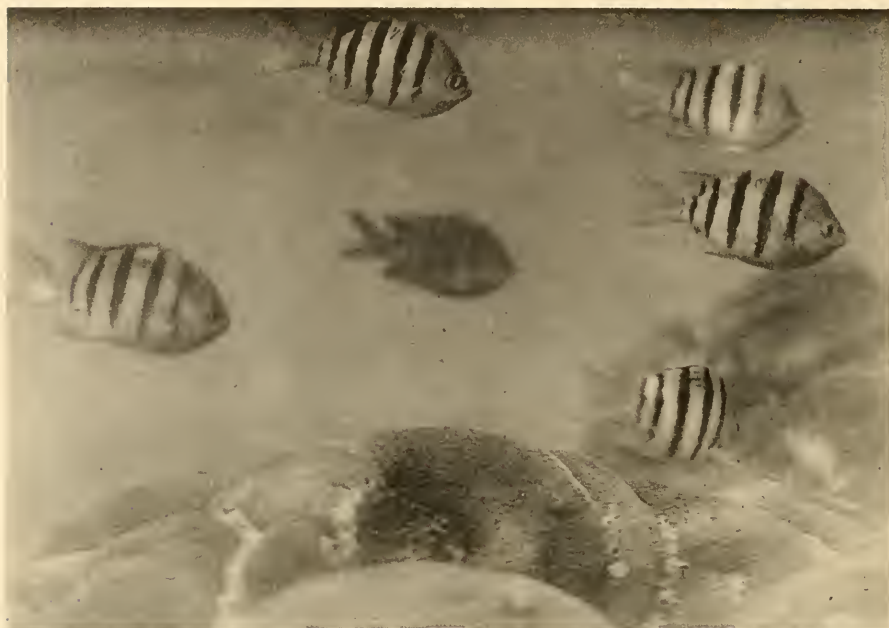


FIG. 1. *Abudefduf saxatilis*, sergeant major, often found swimming high over coral stacks.



FIG. 2. *Abudefduf taurus*, a rare sergeant fish (center). *Lutianus apodus*, schoolmaster (left and right).



FIG. 1. *Lachnolaimus maximus*, hogfish, in very pale plain color phase.



FIG. 2. *Lachnolaimus maximus*, hogfish, in dark banded phase. *Halichoeres bivittatus*, slippery dick, in foreground.

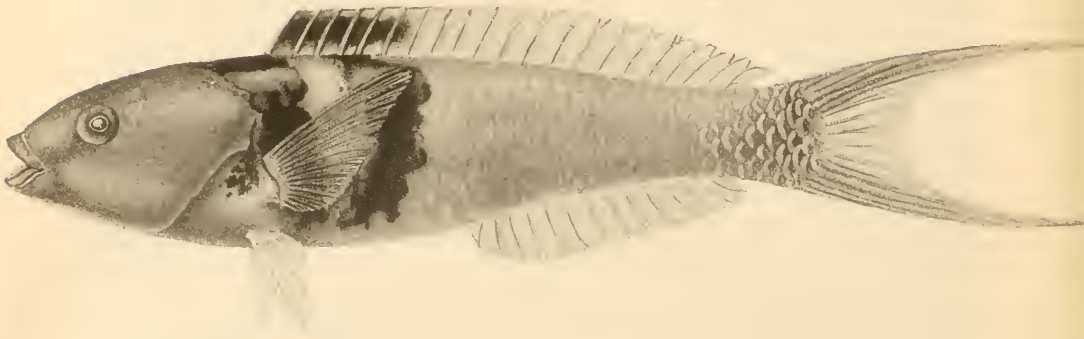


FIG. 1. *Thalassoma bifasciatum*, in "bifasciatum" stage, adult male. (From original in color, painted from life by Manson Valentine.)



FIG. 2. *Xyrichtys psittacus*, razor fish, over a basin with soft sand bottom, which it has constructed of fragments of broken coral. To hide from enemies the fish dives into the basin and burrows in the loose sand.



FIG. 1. *Sparisoma abildgaardi*, red parrot fish, in a dark phase, showing white spots and cream-colored band on caudal fin.



FIG. 2. *Sparisoma abildgaardi*, red parrot fish, lying in a depression on dead coral.



FIG. 1. *Sparisoma abildgaardi*, red parrot fish, in one of its varied color phases, amid gorgonians.



FIG. 2. *Sparisoma pachycephalum*, parrot fish, in foreground at right; a very fine example of blending with the background.



FIG. 1. *Scarus croicensis*, parrot fish, in a distinctly striped color phase.



FIG. 2. *Coryphopterus glaucofraenum*, in light color phase, showing details of markings on head and eyes. (From original in color, painted from life by Manson Valentine.)



FIG. 1. *Opisthognathus aurifrons*, hovering over their burrows, which they enter tail first on the least alarm.

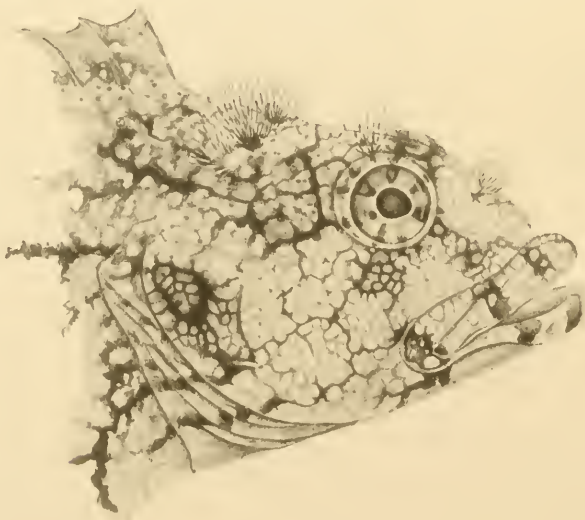


FIG. 2. *Labrisomus nuchipinnis*, female, 140 mm. long, showing details of markings on head and eyes. (From original in color, painted from life by Manson Valentine.)

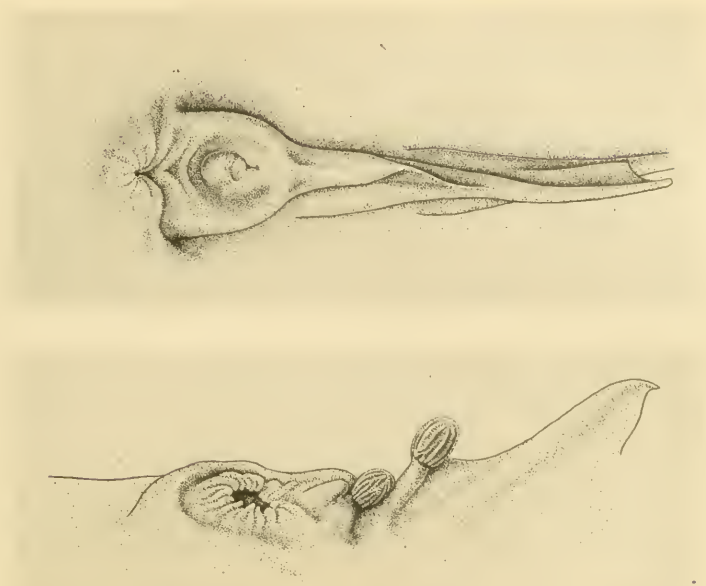


FIG. 1. *Hypleurochilus bermudensis*, showing structure of external genitalia. Upper, female; lower, male. (Drawings by Manson Valentine.)

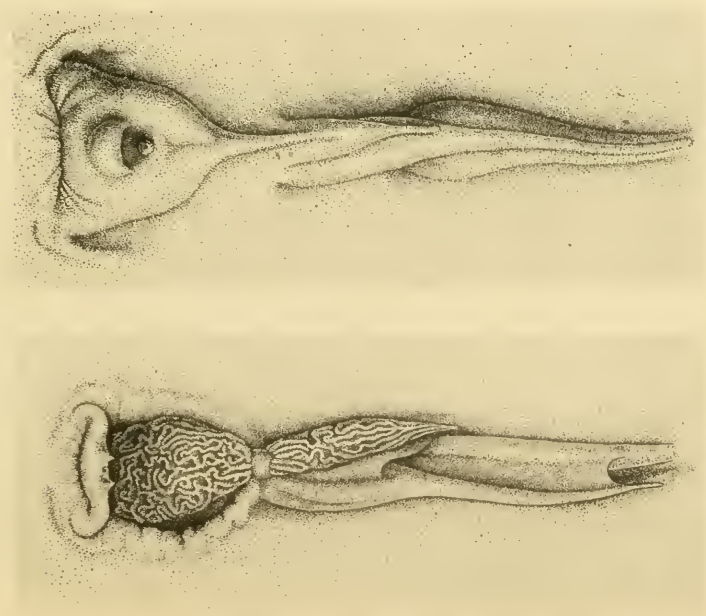


FIG. 2. *Rupiscartes atlanticus*, showing structure of external genitalia. Upper, female; lower, male. (Drawings by Manson Valentine.)



FIG. 1. *Lactophrys triqueter*, trunkfish, engaged in directing currents of water from its mouth against the bottom to uncover food. Light spots less distinct and dark circles more distinct than in figure 2. *Halichoeres bivittatus*, slippery dicks, in background.

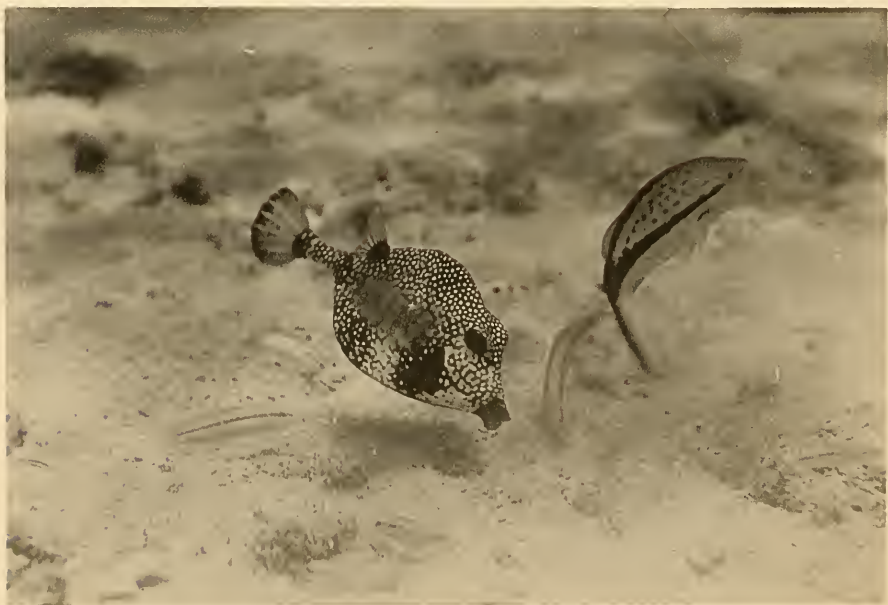


FIG. 2. *Lactophrys triqueter*, trunkfish, in a very distinctly spotted phase, engaged as in figure 1. *Ocyurus chrysurus*, yellowtail, to right, swimming away. *Halichoeres bivittatus*, slippery dicks, in foreground, always at hand to help eat the food uncovered by the trunkfish.



FIG. 1. *Balistes vetula*, queen triggerfish, in one of its brightest color phases.

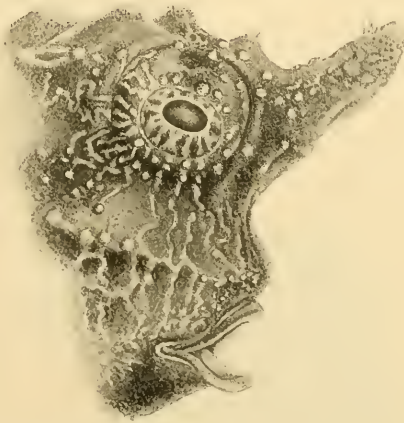


FIG. 2. *Ogcocephalus cubifrons*. Details of markings on side of head. The color of the head is continued on the eye. (From original in color, painted from life by Manson Valentine.)



Histro gibba, sargassum fish, lateral and anterodorsal views. (From originals in color, painted from life by Manson Valentine.)

MADINE

6

1

1871 JUL 11 AM 3

1871 JUL 11 AM 3

